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Journal of the Inventors' Institute.

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VOL. XIV.—No. 3.] MARCH, 1879. [PRICE 6d.

[THIRD SERIES.]

⁂ *Communications to the Editor to be addressed to him at 21, Cockspur Street.*

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Railways, Permanent Way, Rail Joints, Chairs and Sleepers, Portable Railways, Atmospheric Railways, Switches, points, Crossings, and Turntables.—E. Burstow, 240. T. Walmsley and J. Thompson, H. Seddon and G. Collier, 326. T. J. (com.), 331. J. Whittingham, 365. H. Vignoles, 436. C. Schiff, 578. R. P. Williams, 589.

Railways, Carriages, Coupling, Uncoupling, and Altering Position of Carriages and Engines.—R. Morton, 493. J. F. Smith, 577.

Reaping, Mowing, Making Hay, Gathering in Produce.—G. Orendi, 511. C. D. Abel (com.), 643.

Reflectors, &c.—F. Young and J. Freeman, 350. W. R. Lake (com.), 389. J. Jeffs, 641.

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Shirts, Collars, &c.—M. Joseph, 432. A. Franck, 605.

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Trimmings.—J. Steiger, 482.

Umbrellas, Parasols, &c.—W. Corder (com.), 335. A. Clarke, 628.

Urinals.—J. Shanks, 265. O. Gilsow, 512.

Valves, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—J. Shanks, 265. A. M. Clark (com.), 351. J. Hill, 353. A. M. Clark (com.), 448. E. A. Wortmann, 572. W. A. Barlow (com.), 602. H. L. Jones, 610. G. Tellier, 630. F. W. Durham, 651. C. and J. Torkington, J. Hays, and C. G. Mountain, 692.

Velocipedes, Bicycles.—W. Bown, 389. I. T. Townsend. 417. F. Caffarata, 486. J. and T. Puntis, 621. W. Prestwick, 660.

Ventilation; Supplying and Purifying Air for Buildings, Mines, Ships, Carriages, &c.—C. Pieper (com.), 298. W. and R. Fourness, 321. W. C. Woodhead, 559. J. Gilmore and W. R. Clark, 563. B. J. B. Mills (com.), 618. J. Hall, 651. A. Love, 683.

Vices, Clamps, &c.—S. Pitt (com.), 442. J. N. Sperryn, 479.

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Weaving, Braiding, Plaiting, Preparing for Weaving.—J. Blamires, 334. H. Tetlow and T. Johnson, 372. J. Bywater and C. Bedford, 519. H. Lomax and G. F. Bradbury, 524. G. Hadfield, 534. H. Lees, 569. J. Hollingworth, 584. G. Brook and J. Sykes, 619. T. Buerley, 638. A. M. Clark (com.), 676.

Wheels for Carriages, &c.—T. Floyd and W. H. Penning, 478. M. Doubleday and T. Humber, 600. G. D. Owen and R. Dyson, 608.

Window Blinds, &c.—G. G. Bussey, 270. R. Holden, 532.

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Wire-Working, Wire Ropes, Telegraph Cables.—W. Moseley, 307.

Wood and Veneers, &c.—A. A. Hely and W. W. Snook, 564.

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⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

THE VOLTAIC PENCIL.

There is at the present time scarcely a single branch of industry to which electricity is not lending its aid. Art, however, has thus far received but little benefit from this source, if we except the application of electricity to electro-metallurgy. We are pleased to learn, then, that an important discovery has just been made at Paris by M. Bellet, whose invention consists of a voltaic pencil, by the use of which designers and draughtsmen will be enabled to dispense entirely with the aid of the engraver. The editors of *Electricité* state that they have examined beautiful proofs of lithographs and etchings obtained, without the use of the graver, by the effect of a voltaic arc produced at the point of an ordinary lead pencil. Encouraged by his success, the inventor has taken out patents in various countries, and a company has been formed to carry on the process, which will soon be placed before the public. At present there are being prepared models of a series of apparatus which will allow any artist, however ignorant of the mysteries of electricity, to reproduce immediately, and without the aid of any artisan, the most delicate and complicated drawings; and this, too, by a very simple process and at a very moderate price. By a slight modification of the system there may be produced: (1) Stencils analogous to those produced by the Edison pen; (2) lithographs; (2) etchings; stereotypes for typographical work. The initiators of this discovery are confident that an entire revolution will take place in the process of illustrating papers by means of their electrography.

Messrs. John J. Reicherts and David Tipton, of Delaware, Ohio, have patented an improved field roller and planter, by which the seed is dropped by simple mechanism, and then covered by the roller, the ground at the same time being crushed and broken and left in good condition for after operations.

Mr. Thomas Whitfield, of Chicago, Ill., has patented an improved apparatus for filling and capping capsules, by which capsules may be readily filled with a graduated amount of powder and securely capped at the same time.

Reviews.

DR. MACALISTER'S ZOOLOGY AND MORPHOLOGY OF VERTEBRATE ANIMALS.

"An Introduction to the Systematic Zoology and Morphology of Vertebrate Animals. By ALEXANDER MACALISTER, M.D., Dublin, Professor of Comparative Anatomy and Zoology, University of Dublin. Dublin: Hodges, Foster, and Figgis, Grafton Street. London: Longmans, Green, and Co., Paternoster Row.

ALTHOUGH this work is by its title-page termed "An Introduction to Zoology and Morphology," it is in reality a book containing information useful to the progressing student, rather than an elementary treatise adapted for the mere neophyte. Completeness and perspicuity characterise the volume, and, all things considered, the work is one worthy of hearty commendation. It was, the author states, originally written as the second volume of his "Introduction to Animal Morphology," of which the first, or invertebrate part, appeared in 1876. The Board of Trinity College having, with characteristic liberality, offered to publish this volume as one of the Dublin University Press Series, he has re-written it in parts, so as to make it an independent work. The author conceived it impossible to write a strictly scientific treatise in popular language without increasing its bulk proportionally; and having aimed at conciseness and precision, he has endeavoured, both in this volume and its predecessor, to define every term carefully, and having defined it, to use that term instead of a periphrasis. As he has, in the index, referred to the most of these terms, and the places where they are defined, the need of a glossary he considers is obviated. Calling these volumes "Introduction," Dr. Macalister remarks, has been animadverted on, but he thinks the word appropriate, remembering that when a student he found the gap between most manuals then existing and the monographic literature of zoology to be so great that passing from the first to the second was practically entering an unknown region; and hence in this work he has tried to make each part sufficiently comprehensive to enable the student, who wishes for additional knowledge of any forms, to pass from a general study of morphology into the region of detail, without any great intermediate gap. The work, it is stated, was written in 1874, but the author has added to it notices of new discoveries while going through the press so as to bring it up to the present-day state of knowledge. The plan of putting the general principles and important characters in larger type, the details in smaller printing, is adopted throughout; and to ensure accuracy, Dr. Macalister states that he has endeavoured, as far as possible, to check description by dissections, and thus has been able to verify a large proportion of the statements made in this volume.

THE ART OF SCIENTIFIC DISCOVERY.

"The Art of Scientific Discovery, or the General Conditions and Methods of Research in Physics and Chemistry." By G. GORE, LL.D., F.R.S. London: Longmans, Green and Co., 1878.

UNDER the above title Dr. Gore has given to the world a work which is eminently worthy of careful perusal as referring to a subject which admits of a great deal of mental philosophy being brought to bear upon it; and it is not too much to say that he has fully discussed the whole question with so much philosophical acumen that we doubt whether another book could be now written on this topic which should possess any additional features essential to the elicitation of all its points and bearings.

Many persons will feel somewhat startled at the idea that scientific discovery can in any true sense of the term be considered *an art*, and Dr. Gore expresses himself as fully alive to this, for in his preface he observes:—"Whilst I do not forget Dr. Whewell's assertion that, speaking with strictness, an *art of discovery* is not possible, that we can give no rules for the pursuit of truth which shall be universally and peremptorily applicable, and that the helps which we can offer to the enquirer in such cases are limited and precarious, I have his hope that aids may be pointed out which are neither worthless nor uninstructive."

Where all is good, as in this work, it is difficult to select any particular passage as a choice one, but the following will, we think, be read with much interest, and be a fair exemplar of the whole work:—

"Although wealth is not necessary to research, a moderate competency is essential for long-continued investigation. Experiments cost money and require much time, and few men can long pursue difficult investigations with the cares and anxieties of life pressing upon them. Cavendish was a very wealthy man, and also a great investigator, but he neglected attending to his wealth, probably because he preferred to attend to research. Scheele was comparatively poor, yet he made a greater number of chemical discoveries at an earlier age than almost any man. He was, however, unmarried, and without the cares of a family. He had the advantage of having been the pupil of Bergmann, and was encouraged in his pursuits by Prince Henry of Prussia and by the Duke of Sudermannia. He was also extremely industrious, and of a strictly logical habit of mind. In addition to freedom from anxiety and pecuniary care, a large amount of quiet leisure is almost indispensable, and those who cannot obtain this cannot make many discoveries. Priestley made numerous experiments; his occupation as a Unitarian preacher afforded him the time, and his friends and admirers found him a sufficient supply of money.

"In consequence of the large amount of time necessary for research, those scientific men who devote themselves largely to the more remunerative occupations of pursuing a scientific art or trade, making investigations for manufacturers or public companies, developing inventions or patents, making chemical analyses for commercial purposes, giving scientific evidence in courts of law, delivering popular scientific lectures, writing scientific books, &c., are not usually the most fruitful discoverers.

"It has been suggested that by employing a sufficient number of assistants to make the experiments, an experienced investigator might make a much greater number of discoveries, but this is hardly correct; the limit to the advantage of employing unskilled assistants is soon attained, because in most researches each experiment requires to be skilfully watched and its results carefully studied, and the latter especially occupies much time, and can only be effectually done by the investigator himself. Moreover, it is not so much the number of experiments as the accuracy with which they are performed, the acuteness with which they are observed, and the intensity with which the results are studied which yield truth. Skilful watching of an experiment often suggests its true explanation, or detects a new truth which an ordinary assistant would overlook. A multitude of experiments also, unskilfully performed, are worse than useless, because they confuse and mislead. It is chiefly in cases where a long series of experiments or observations of a routine kind have to be made that an ordinary assistant can be of much service.

"If assistants possessing scientific genius are employed, then the discoveries they make are largely due to that genius, and the credit of these discoveries may be partly claimed by them, and this circumstance has in many cases given rise to unpleasant disputes as to whom the honour of a discovery should be given. For the purpose of rearing investigators, the employment of skilled assistants is good. Bergmann adopted that plan; he contrived experiments and his pupils executed them. He educated several chemists, one of whom was Scheele, and Bergmann said that his greatest discovery was the finding of Scheele. But Scheele disliked Bergmann at first, because he took the credit of Scheele's discovery of oxalic acid by publishing it, and omitting by inadvertence to mention Scheele's name. Gahn, however, reconciled them, and they became good friends. Faraday adopted the plan of employing an obedient unskilled assistant, who had been a soldier, and the plan worked well.

"Many valuable researches have been made by a kind of partnership method, the work being suitably divided, and the results published in the joint names of the investigators. For instance, the isolation of boron and the discovery how to obtain potassium and sodium by distillation of soda with iron were made by Gay-Lussac and Thenard; that of electrolytic transfer of the elements of acids and salts to the respective poles of a voltaic battery by Hisinger and Berzelius; the decomposition of water under the influence of a voltaic current by Nicholson and Carlisle; that of platinum residues containing a new metal by Fourcroy and Vauquelin; and a great many more have been made by this method, as may be easily seen by referring to the 'Catalogue of Scientific Papers,' published by the Royal Society.

"The influence of age upon the ability to make researches and discoveries does not appear very conspicuous; the power of research usually continues as long as the senses and intellect remain unimpaired. Galileo was born at Pisa in 1564, and made his first discovery—that of the principle of the pendulum—before he was twenty years old. He continued to make observations and discoveries throughout nearly the whole of his life, the latter part of the time being, as is usual, the most devoted to reflection, writing, systematising his knowledge, and getting it published. He died at the age of seventy-eight."

The following quotation will also be of interest to many of our readers who remember the late Zerah Colburn:—

"The case of Zerah Colburn, the son of an American peasant, is especially remarkable among these, not only for the immediateness and correctness with which he gave the answers to questions resolvable by simple but prolonged computation, such as the product of two numbers each consisting of two, three, or four figures; the exact number of minutes and seconds in a given period of time; the raising of numbers up to high powers; or the extraction of the square and the cube roots; but, still more, for his power of at once answering questions to which no rules known to mathematics would apply. On being interrogated as to the method by which he obtained these results, the boy constantly declared that he did not know *how* the answers came into his mind. In the act of multiplying two numbers together, and in the raising of powers, it was evident (alike from the facts just stated and from the motions of his lips) that *some* operation was going forward in his mind; yet that operation could not (from the readiness with which the answers were furnished ,have been at all allied to the usual mode of procedure, of which, indeed, he was utterly ignorant, not being able to perform on paper a simple sum in multiplication or division. But in the extraction of roots and in the discovery of factors of large numbers, it did not appear that any operation *could* take place, since he answered *immediately*, or in a very few seconds, questions which, according to the ordinary methods, would have required very difficult and laborious calculations, and *prime* numbers cannot be recognised as such by any known rule."

WATTS'S DICTIONARY OF CHEMISTRY.

"A Dictionary of Chemistry and the Allied Branches of other Sciences." By HENRY WATTS, B.A., F.R.S., F.C.S., Editor of the "Journal of the Chemical Society." Assisted by eminent contributors. Third Supplement, Part I. London: Longman, Green, and Co., 1879.

THE "Dictionary of Chemistry," of which the book before is the third supplement, part I., is a work of such well established authority that all we can do is to state that this particular work has been written with the professed object of bringing the record of chemical discovery down to the end of the year 1877, including some of the most important discoveries which have appeared in 1878. As it comprises a longer interval than the preceding supplements, and is therefore necessarily larger, it is to be published in two parts. The author with great pleasure acknowledges the assistance of the following gentlemen, who have contributed articles to the first part:—E. J. Mills, D.Sc., F.R.S., "Young" Professor of Technical Chemistry in Anderson's College, Glasgow: "Cumulative Resolution." T. E. Thorpe, Ph.D., F.R.S., Professor of Chemistry in the Yorkshire College of Science, Leeds: "Flame." R. Warington, Esq., F.R.S.: "Barley—Forest Trees."

For the second part, contributions have, it seems, been kindly promised by Dr. Armstrong, F.R.S., "On Napthalene and its Derivatives," "On Phenols," and "On Substitution;" by Dr. Flight, of the Mineral Department, British Museum, "On Meteorites;" by Prof. G. C. Foster, F.R.S., "On the Dynamical Theory of Heat;" by Dr. Roscoe, F.R.S., "On Spectral Analysis;" by Dr. Thorpe, F.R.S., "On Special Volumes," and "On Water;" and by Mr. Warington, "On Wheat."

The present supplement is as worthy of high commendation as the main work, and it may be said to be a dictionary of modern chemical progress complete in itself. It is indeed a marvel of industrious scientific research To give examples of the value of a work like this is a matter of difficulty; but we make quotations at random, hoping that chance may favour our selection:—

"Apiol, or parsley camphor, is a crystalline substance extracted with a liquid turpene by distilling parsley-seeds with water. It forms long white brittle needles, melting at 30° and boiling at about 300°. By boiling it with alcoholic potash it is converted into a body which crystallises in pearly, rhombic plates, melting at 535°, and contains, as a mean of three analysis, $C=65{\cdot}4$, $H=5{\cdot}5$. The last body, boiled with dilute nitric acid a substance which crystallises from alcohol in long, brilliant yellow needles, melting at 114° and dissolving gradually in boiling potash with deep purple colour.—(V. Gerichten, *Deut. Chem. Ges. Ber.*, ix., 1477).

"*Erythrophenic Acid.*—According to Jacquemin (*Bull. Soc. Chem.* [2] xx., 68), the sodium salt of this acid is produced by action of sodium hypochlorite on a mixture of aniline and phenol. It forms salt solutions of a deep blue colour, a reaction which may be made available for the detection of aniline or of phenol.

M'NAB'S BOTANY.

"Botany: Outlines of Morphology and Physiology." By W. R. M'Nab, M.D. London: Longmans and Co.

THE appearance of this work may be said to mark an era in modern botany, for the real acquisitions to science that have been made in Germany are by it made available to Englishmen. No one is better fitted to secure this result than Prof. M'Nab. For the discovery of the morphological links which bind together the lower plants with the Conifers and Cycads, and even with the flowering plants—links which at least suggest the probable course of descent of the groups in question—we are mainly indebted to the Germans, and in their text-books the natural orders have been re-arranged in conformity with these discoveries. We heartily recommend this book to all students of botany.

JOURNAL OF SCIENCE.

"Monthly Journal of Science" for February. Edited by WILLIAM CROOKES, F.R.S., &c. London: Horse-Shoe Court, E.C.

WHEN the *Quarterly Journal of Science* was first established, now fifteen years ago, the Editor in his introductory address said it was not improbable that a periodical organ of this nature, professing to keep abreast with the intellectual career of mankind, and even to act as a pioneer, might in due time require a material change of character. The time for such a change has, in his opinion, now arrived. During the last few years research has been so quickened and multiplied—brilliant discoveries have succeeded each other so rapidly—that intervals of three months are too long for a journal which seeks to be a connecting link between the scientific investigator and the educated reading public. A discovery made, a theory propounded, or a discovery made in January has, before April, been duly discussed, and new questions have attracted general attention.

The old quarterly organs of literature, politics, and social science, quite irrespective of their ability, find themselves anticipated by monthly journals. Hence, therefore, the editor of this journal has resolved for the future to issue it monthly instead of quarterly, and by extending its scope so as to include new branches or divisions of science, he trusts it will become a complete record of scientific progress.

This number contains the following articles:—"Progress—The Alleged Distinction between Man and Brute;" "Matter Dead—Roger Bacon and John Dalton;" "A Contribution to the History of Electric Lighting," by W. Mattieu Williams, F.C.S., F.R.A.S.; "The Problem of Flight—Ballooning in Arctic Exploration;" "Electric Lighting." by Prof. W. E. Ayrton; "Instinct or Reason?" "New Achromatic Microscope;" "Safe Anæsthesia;" "On the Transmission of Power by Means of Electricity," by Profs. Elihu Thompson and Edwin J. Houston.

MUSIC.

"The Knight and the Fair Ladye:" a Ballad. "To Find my Love a Posy:" a Pastoral Song. By Miss Elena Corri. London: Ransford and Son.

THE first of these songs has the character of the old English ballad style, the music of which speaks the words only to be felt when sung. The latter, a pastoral, has all the freshness of originality, with a joyous chorus, scarcely equalled in some of the most popular of the day. There is a tuneful inspiration throughout the music which none but a true musician could conceive. Miss Corri is, we understand, a niece of Douglas Jerrold. She is already known as a composer, and these charming songs will not fail to win her more admirers.

SCRIPTURAL PROPHECY.

"Scriptural Prophecy Now Being Fulfilled, with Special Reference to the Prophet Daniel and the Revelation of St. John. By A. FULTON. Second edition. London: E. W. Allen, 11, Ave Maria Lane, E C.

IN this pamphlet the author, taking his views from the Scriptures and basing his calculations as to dates from antecedent events, endeavours to reconcile the present with Scriptural prophecy.

MESSRS. CASSELL'S PUBLICATIONS.

WE have to notice the receipt of several parts of the "Dictionary of Mechanics," "Science for All," and "Great Industries of Great Britain," which certainly fully equal in ability and interest any former portions of these works.

FOREIGN SCIENCE.

AT one of their recent meetings, the Municipal Council of Paris agreed to authorise the Prefect to make arrangements with the Societé Général d'Electricité for lighting the Avenue de l'Opera, and two or three other of the principal streets of Paris with the electric light. Also to have two or three other streets lighted by gas on a new and improved system, greatly superior to that now in ordinary use by one of the largest gas companies. The trial is in each case to last for one year, at the conclusion of which the Council will be enabled to determine which is the most advantageous method, and therefore the most suitable for future use in the city.

The production of the French vineyards for 1878 appears to have been tolerably good in comparison with preceding years, notwithstanding the almost total destruction of something like a million and a quarter acres by the insect known as phylloxera. The quantity of wine manufactured is stated to be considerably more than one thousand million gallons, and of cider and perry about a quarter of that amount.

From calculations lately made by M. Lunier, a professor in the Academy of Medicine, it seems that the quantity of alcoholic liquor annually consumed in France amounts for the whole country to an average of somewhere about twenty-seven gallons for each inhabitant, or just about double what it was a little more than fifty years ago.

The following gentlemen have been appointed directors of the observatories of Lyons, Bordeaux, and Besançon respectively for the next five years, viz., Lyons, M. Andre; Bordeaux, M. Rayet; Besançon, M. Saint-Loup.

The death of M. Gervais, a distinguished member of the Academy of Sciences, and professor of anatomy and zoology, is announced.

An interesting article by M. Camille Flammarion, on the question "Is the Moon Inhabited?" appears in a recent number of our contemporary *La Correspondance Scientifique.* The same eminent writer has proposed that a free observatory, provided with a powerful telescope should be established in France.

A statement of some new chemical analyses worthy of observations will be found in the Proceedings of the Imperial Academy of Sciences of Vienna. The analyses were made by M. J. Paluj.

An electric lamp, somewhat remarkable for its simplicity and solidity of construction, has been devised and manufactured by Messrs. E. Ducretet and Co., of Paris. It consists essentially in the employment of a column of mercury into which the carbon rods or pencils for producing the light are placed. This lamp can, it is said, be made very cheaply.

A Swiss journal publishes some observations of Captain Nodot on a terrific storm which took place last month on Lake Leman. Some waterspouts of rather remarkable dimensions passed over the lake, and the waves rose to a height of more than twenty feet. The storm took place in the night, and the lake, illumined by lightning of unusual brilliancy, is said to have presented a grand spectacle.

WATER SUPPLY IN AUSTRALIA.

At a recent meeting of the Institution of Civil Engineers two papers were read on the subject of the construction of works of water supply in Australia.

The author, Mr. Edward Dobson, Assoc. Inst. C.E., stated in the first paper that in August, 1871, Lieut.-Col. Sankey, R.E., reported to the Victorian Government, recommending the construction of the following works, some of which had only been partially executed, viz.:—1. An open channel from Wallace's Swamp to the Stony Creek reservoir; 2. A storage reservoir at the head of Stony Creek, 26 miles from Geelong, with a capacity of 754,000,000 gallons; 3, A brick-lined aqueduct, communicating by a natural watercourse with a small pipe-head reservoir at Anakie Gap, holding 1,330,000 gallons; 4. A length of about 13¾ miles of 12-inch and 14-inch main, leading from the pipe-head reservoir to the service reservoir; 5. A service reservoir at Lovely Banks, with a capacity of nearly 6,000,000 gallons, and filter beds to pass 1,250,000 gallons every twenty-four hours; 6. About four miles of 16-inch and 2½ miles of 15-inch main, leading from the service reservoir to the town of Geelong; and 7. About 42 miles of submains, varying in diameter from 12 to 3 inches. The population of Geelong and its suburbs was under twenty-five thousand. The cost of these works, up to the 1st of July, 1871, had been £281,772. Among Col. Sankey's suggestions for the completion and improvement of the water supply, the following were important, as bearing on the subsequent history of the works, viz., that the water should not be allowed to rise within 15 feet of the bye wash, until all subsidence of the dam had ceased; that, instead of conveying the water to the pipehead by an open aqueduct, a main should be laid for the whole distance; that relieving reservoirs should be constructed between Anakie and Lovely Banks, to lessen the pressure on the main; and that there should be a bye-pass at the service reservoir to allow of the latter being shut off for repairs without interfering with the town supply. Several of these works had been successfully completed under the immediate direction of the author, as resident engineer of the Geelong district, Mr. George Gordon, M. Inst. C.E., being the chief engineer of Victorian water supply.

The works which formed the subject of the paper were:—The failure and repair of the Upper Stony Creek reservoir; the driving of a tunnel, 88 chains long, through a volcanic formation at Anakie Gap; and the laying of a new 9-inch main, for a distance of four miles, through the gorge of the Stony Creek valley. The failure of the Stony Creek dam was attributed to an injudicious selection of the site, the foundation being unsuitable for its construction. This had led to a subsidence of the puddle wall, and, after the water had been let out of the reservoir, to a slip of the water face of the dam. The dam was repaired by pumping out the water and slush lying below the level of the outlet valve; by cutting a new bye-wash at the north end of the dam, 27 feet lower than the original bye-wash; by placing the stone from this cuttting in front of the slip; and by bringing the bank up from the new toe at a slope of 4 to 1 instead of 3 to 1. The cost of these repairs was under £4000. The concrete dam at the lower reservoir had been erected in a gap at the lowest of the reefs which divided the Stony Creek valley into basins, giving a storage reservoir of about 142,000,000 gallons, with a depth of 42 feet of water over the outlet pipe. The concrete was broken sandstone, quarried on the spot, mixed with cement mortar, made of pit sand and Portland cement, in the proportions of—2-inch metal 4½, screenings 1½, sand 1½, and cement 1. The foundation of the dam was chiefly on vertical strata of slate and sandstone. The form of and the mode of construction of the dam were described. The cost of the work was £17,000, exclusive of engineering superindence. On the line of the new main five short tunnels were driven through spurs in the gorge of the Stony Creek, which spurs consisted of vertical strata of sandstone and hard slate, the strike being at right angles to the direction. The minimum size of the tunnels was 6 feet 3 feet, and their total cost was a little more than £3 per lineal yard. The main difficulty experienced was in respect of the ventilation of the headings of the principal tunnel at Anakie Gap. Both lithofracteur and ordinary blasting powder had been used. The wages paid at this tunnel per day had been 5s. for boys, 6s. 6d. for labourers, and 7s. for miners. The works for the length of 4 miles, on the course of the 9-inch main, which connected the lower reservoir with the 14-inch main, comprised 21 creek crossings with 16 stone weirs, two heavy rock side cuttings, two retaining walls across gullies, and six tunnels of the aggregate length of 2094 yards; whilst the levels of the ground passed over varied from 150 feet below to 115 feet above the hydraulic gradient. As a regular gradient was impracticable, the plan pursued was to follow the bottom of the valley to the mouth of the gorge, then to tunnel through the spurs, where the windings of the creek would have made this course too circuitous, and to ascend by a steep incline, so as to obtain the shortest route to the tunnel mouth without raising above the calculated gradient. To deliver the required quantity of 750,000 gallons every 24 hours, this gradient was fixed at 4 inches per chain for the 9-inch pipes, and at 2 inches per chain for the old 14-inch pipes. Instead of self-acting air-valves, blow-off cocks were attached to the mains at the principal summits, and the maximum delivery of the new mains was often 1,100,000 gallons in 24 hours, or 350,000 gallons in excess of the calculated delivery. The average cost of of laying the new mains was less than 11s. per lineal foot. This included the cartage of the pipes for a distance of 24 miles, earthworks, retaining walls, and stone weirs, but was exclusive of the driving of the tunnels, and of the cost of the pipes. The cost of laying the mains through the tunnel came to rather more than 11s. per lineal yard. The wages paid per day were 6s. 6d. for labourers, and 9s. for joiners.

In an appendix the author gave the details of the Stony Creek reservoir, aqueduct, and pipe-head reservoir, of the lower reservoir, new main, and Anakie Tunnel, of the distances and levels of the old main, from its junction with the new main to the valve-house at Lovely Banks reservoirs and of the service reservoirs, with a statement of the expenditure under various heads upon the works of the Geelong water supply from the 1st of April, 1872, to the 31st of December, 1875.

The second paper read was on "The Sandhurst Water Supply, Victoria, Australia," by Mr. Joseph Brady, M. Inst. C.E.

Sandhurst, the central town of the Bendigo goldfield, was about 105 miles north-west of Melbourne by railway. The population dealt with in the water supply was thirty-five thousand, the number of houses nine thousand one hundred and fifty, the number of mines assessed four hundred, and there was a length of about one hundred miles of proclaimed streets. The site occupied high ground between the river Campaspe and the river Loddon, and was drained by the Bendigo creek. The elevation of the city varied from 700 to 900 feet above the low water of spring tides at Melbourne. The average rainfall for thirteen years was 23·13 inches, ranging from 10·95 inches to 38·57 inches. The heaviest fall of rain in a single day was 3·22 inches in the month of February, 1871. The greatest amount of evaporation from one of the reservoirs observed in a single day was 0·50 inch.

Prior to 1858, Sandhurst was chiefly supplied by rain-water, stored in small iron tanks above ground. During dry weather the water was obtained from small mining dams by carters, who sold their loads at about £3 5s. per 1000 gallons. In April of that year the Bendigo Water Works Company was formed, and subsequently carried on operations under an act of the Victorian Parliament of the 24th of February, 1859. The original scheme was a comprehensive one for domestic and mining supply, but financial difficulties led to the adoption of the former only, which embraced a storage reservoir with a capacity of 60,000,000 gallons, and the necessary means and filter beds, on the gravitation principle. The reservoir was quickly filled in ordinary seasons, but became empty in the drought of 1865, when the city was supplied with water by railway from the river Campaspe. The demand for water increasing, the Municipal Council purchased the Bendigo Waterworks for £43,000, and took possession on the 1st of January, 1872. The whole consisted of one storage reservoir, filter beds equal to a delivery of 200,000 gallons per day, and about 12 miles of mains from 3 inches to 7 inches in diameter. The author, who had completed the works of the company, was engaged by the city council to design and carry out the necessary extensions. In the Sandhurst district there were now two storage reservoirs and filter beds, and about 63 miles of mains and reticulation pipes. The reservoirs were named the Big Hill, constructed by the Bendigo Waterworks Company in 1858-59, and the Crusoe, constructed by the Sandhurst City Council in 1872-73. The surface level of the former reservoir was 991 feet above sea-level; its area was 18 acres, and gathering ground nearly 4000 acres. The formation was schistose. The dam was of earthwork, with a central puddle-wall. It was 350 yards long, 30 feet high in the middle, and abutted on abrupt hills at each end. It contained 77,000 cubic yards of material. The average cost of the earthwork was 1s. 7½d. per cubic yard, and of the puddle 4s. 9½d. The top width was 12 feet, at 5 feet above the highest water level. The inner slope was 3 to 1, covered with gravel, and the outer one was 2 to 1, soiled and grassed. Further details were given of the dam, and of the the method adopted to consolidate it. A bye-wash through a depression in the hills, provided for the passage of surplus water into a neighbouring valley, clear of the locality. The outlet was of a 7-inch cast-iron pipe, well protected, and fitted with a brass delivery valve, of Guest and Chrimes's pattern.

A few years after completion an accident happened to one of the pipes. During the repairs water was drawn from the reservoir over the dam by a 5-inch cast-iron siphon, which has since been used as an auxiliary to the 7-inch delivery pipe. The construction of a pair of filter beds, each 45 feet square, was then described; but as sand filtration did not sufficiently purify the water, which contained 30 to 40 grains of clayey matter to the gallon, at first two setting ponds, and afterwards a third pond, adapted for purification of the water by the lime process, were added, with a capacity respectively of 30,000, 22,000, and 123,000 gallons. The maximum daily supply of water that could be delivered from these works was 200,000 gallons, and the supply had latterly been limited to the highest levels of the city.

The Crusoe reservoir had a capacity of 330,000,000 gallons. Its area was 80 acres, and its greatest depth was 40 feet. The dam was of earthwork, 700 yards long, with a maximum height of 47 feet. The total quantity of earthwork, including puddle, was 306,000 cubic yards, and it cost

£25,400, besides £4357 paid for compensation. The dam was 12 feet wide at the top. The inner slope of 3 to 1 was covered with rough stone pitching and gravel, and the outer one, of 2 to 1, was grassed. The construction of the dam was carried out by contract, under a schedule of prices, and was fully described. The level of the top of the dam at each end was 4 feet above the highest water-line, rising to 7 feet for the middle length. Provision was made for shrinkage, which had occurred to a small extent; but the slopes of the dam had preserved their form. The bye-wash of the reservoir was arranged in a depression of the hills, and and discharged ehe surplus water into a lateral valley clear of the works. The outlet of the Crusoe reservoir was by a cast-iron siphon, 18 inches in diameter and 515⅛ feet long, the inner leg being 206½ feet, the crown 88 feet, and the outer leg 221 feet. The siphon did not cross the dam at right angles in a vertical plane, but was laid on its side. Details relating to the siphon were given. It led to a valve-house, and finished with a bell-mouthed end in the lime pond of the setting works, under a constant head of 4 feet of water. The siphon was filled with water in January, 1873. At the level of 908 feet of water was 4500 gallons per minute. At 938·5 feet the discharge was 9700 gallons per minute. In connection with this reservoir there were filter work, or settling ponds, sufficient for the treatment of 1,000,000 gallons of water per day; the remaining 2,000,000 gallons of unfiltered water could be used for mining or irrigation purposes. The Crusoe settling ponds were described in detail; their object was to clear large quantities of water without the agency of sand filtration. Excellent bricks were manufactured within 300 yards of the site at a cost £2 3s. per thousand. The principal items of work were:—Excavation in clay and schistose rock, 16,401 cubic yards, 1s. 8d. schedule rate; brickwork in cement, 3149 cubic yards, £2 5s. to 2 15s. schedule rate; cement concrete in floors, 2117 cubic yards, £2 schedule rate; puddle behind walls, 1284 cubic feet, 4s. 6d.

The rate of wages for eight hours' work were:—Bricklayers, 12s. per day; bricklayers' labourers, 8s.; fitters, 12s.; blacksmiths, 10s. to 11s.; ordinary pick and shovel men, 6s. 6d. to 7s. 6d.; and horse and cart and drive, 14s. per day. Various precautions observed in carrying out the works were enumerated. In preparing the water, it was delivered from the siphon into the lime pond, where it was mixed in the the proportion of one pound to a thousand gallons of water, and passed into one of the settling ponds, in which the water became clear in about ten hours. After this the water was drawn off as required into the service reservoir. The settling ponds required washing out every three months; the service reservoir was cleaned annually. In connection with the Big Hill and Crusoe reservoirs there were two distinct mains, each with one system of recticulation. The mains of the former system were twelve and a half miles in length; of the latter system, fifty and a half miles. The paper concluded with some details of the service relative to the mains, the fittings, and the maintenance.

A REPLY.

Do I remember old days?
  Does the sunlight ever rest
In transforming golden rays
  Across the grey sea's breast?

Ah! so from our cherished past
  Shines a passionate light,
Whose radiance aye is cast
  Over a wreck'd life's night!

V. Gonville.

CHEMICAL MEMORANDA.

We extract from the columns of the *Chemical News* the following communications, which appear to be worthy of attention:—

Means of Detecting the Adulteration of Saffron.—To detect adulteration with *Calendula flowers* (Feminelle), it is merely required to moisten a few flowers, and to rub them singly with the finger on white paper. The genuine flowers will give a fine rich yellow colour, whilst the Feminelle will only yield a violet reddish hue. It can also be easily detected by soaking the suspicious flowers in pure or, better still, distilled water. The real saffron will retain its fine red colour after hours, whilst the Feminelle will lose its artificial tint within a short time. To detect an admixture of honey and barytes it is merely required to put a pinch of saffron in a tumbler with pure clear water (also in this case distilled water is preferable), and agitating it for a few minutes. Adulterated saffron will at once turn the water cloudy, and even small particles of dust may be seen falling to the bottom, which, on pouring the water carefully out, will be found to be a slimy, sand-like mass. With pure saffron the water will remain clear, showing a fine pure yellow colour, which, according to the quality of the flowers, will be more or less intense. Five or ten minutes suffice for these experiments.

A New Fast Green and Malachite Green.—Up to the present the so-called methyl-green has been obtained from dimethyl-aniline by converting the latter into violet by oxidation, and then the violet again by methylation into green. It has long been the endeavour of the manufacturers of aniline colours to get the green direct from dimethyl-aniline without going through the violet; and taking as starting-point the theoretical and meritorious studies of Prof. A. Baeyer, Otto Fischer, in Munich, and Oscar Doebner, in Berlin, it has been found possible to produce green direct from dimethyl-aniline, and even at a very low price. These nirect are brought into the market under the names of New Fast Green, Malachite Green, &c., and possess about the same chemical qualities, but the mode of manufacture and the attention paid to the same, cause more or less a difference in brilliancy of shade and yielding. It is, however, very easy to distinguish direct greens from methyl-greens through the simple fact that wool, silk, or cotton, when dyed with direct greens, can stand a very high degree of heat without the green colour turning into violet; whilst stuff dyed with methyl-greens turns violet when brought into contact with an iron exceeding 120° of heat. The aforesaid theoretical mode of Otto Fischer, in Munich, was published in the reports of the Berlin Chemical Society on August 11, 1877, under the title of "Condensations Producte Tertiärer Aromatischer Basen." Otto Fischer describes therein a new base, which he obtains by the reaction of dimethyl-aniline, chloride of zine, and hydride of benzyl, and further states that oxidising the salts derived from his method led to the production of a beautiful bluish green colour. The exceedingly high price of the hydride of benzyl has hitherto prevented the practical application of Fischer's most interesting discovery. Now, however, this material is produced at a price which renders its practical use quite possible. The process of manufacturing malachite-green is based upon the theoretical studies of Oscar Doebner, published in the reports of the Berlin Chemical Society, May 27, 1878. Doebner proves proves in his report that green can be obtained direct from dimethyl-aniline, chloride of zinc, and trichloride of benzol. Besides the before-mentioned system of producing direct greens through the medium of hydride of benzyl, there are other methods by which the same can be obtained: for instance, the product of the reaction of dimethyl-aniline, chloride of zinc, and dichloride of benzoyl, submitted to oxidation, gives a very beautiful and cheap green. From the preceding statement it is obvious that different methods of manufacturing direct green exist.

Water Analysis.—Dr. Phipson writes as follows:—I have perused with much interest Dr. Tidy's valuable paper on "Water Analysis," publiſhed in the January number of the *Journal of the Chemical Society*, and am of opinion that he has done good service in drawing attention to the most accurate methods to be adopted in the examination of waters, more especially to the employment of the two-foot tube and the action of permanganate during the first hour. The point which still remains to be discovered, however, is where to draw the line; this is the main question, and is by no means decided by any paper on water analysis yet published. For years past our text-books, both English and foreign, have stated that when the total impurities of a sample of water reach beyond a certain figure the water is to be condemned. But this is a mere assertion which has been copied from one book into another for the last thirty years or more. The fact is, we possess at present no positive data whereby to condemn a sample of drinking-water, and cannot possess such data until physiological experiments have been made to prove when and why a given kind of water is bad or good. In most cases it is not difficult to prove a water good for drinking, but quite the reverse to establish that it is injurious to health or unwholesome, unless it be very bad indeed. What the chemist requires is to be able to state with certainty that a water which discolours so much permanganate of a given strength may a water discolour and yet be good for drinking? That is a point of the utmost importance, which Dr. Tidy's laborious and interesting investigations have not solved any more than his predecessors' in the same branch of research have done. Of the hundreds of analyses which pass through my hands every year there are none which give me so much trouble and anxiety (I can use no other word) than drinking-waters. Let us suppose that the ingredients of a well-water consist of carbonate of lime, 25 grains; sulphate of lime, 18 grs.; nitrates and chlorides of magnesium, calcium, and sodium, 20 grs.; organic matter, 7 grs.; total, 70 grs.; and that the microscope shows neither micropoytes nor animaculi in the water or slight deposit it may leave on standing; that the 7 grains of organic matter consist almost entirely of crenate of ammonia which can be separated by alcohol. Is such a water unwholesome to drink? If so, why? Now let us suppose that these 7 grains of organic matter are some putrescent matter in a state of decomposition. Would the water then be injurious to health? I must confess that we have no positive answer to this important question. (And 6 grains of organic matter is more than is present in the great majority of waters used for drinking.) The thing to be determined is, as I said before, where to draw the line. On what authority are we to condemn a water as unfit for drinking? Perhaps the permanganate solution as used by Dr. Tidy may help to solve the problem. The questions which require to be solved are apparently very simple:—(1). How much organic matter in a putrescent state (*i.e.*, how much permanganate in the hour) may be tolerated in a specimen of water before that water is condemned as unfit for drinking? (2). How much nitrates and chlorides may be present in a gallon of water before this water is pronounced unwholesome? These questions cannot be answered by mere supposition or conjecture. Let me recommend these points to medical men who are devoting themselves to the examination of drinking-water.

THE SCIENTIFIC REVIEW
AND
Scientific and Literary Review
(Journal of the Inventors' Institute)
Is published at the
OFFICES, 21, COCKSPUR STREET, CHARING CROSS, LONDON, S.W.,

In the 1st week of every Month, sent post free on prepayment of the ANNUAL SUBSCRIPTION OF 6s. 6d.; or it may be had by order, from Messrs. KENT AND CO., Paternoster Row, or any Bookseller or Newsagent in the kingdom, *price* 6d. *per copy*.

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Editor's Office*: 21, *Cockspur Street, Charing Cross, S.W.

THE INVENTOR'S INSTITUTE,

4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE. LONDON.
ESTABLISHED 1ST MAY, 1862.

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President, SIR ANTONIO BRADY.

SESSION 1878—1879

Members' Meetings—at 8.15 p.m.—

Thursday, March 13th.—" The Electric Light."

Thursday, March 27th.—Exposition of Inventions; and the Patent Question, if necessary.

The other Meetings of this Session are—April 10th, 24th; May 8th, 22nd; June 5th.

Executive Council Meetings at 7.30 p.m.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

AT the meeting of the Executive Council on 6th February, the Secretary reported that in regard to the Inventors' Department at the Agricultural Show, he had communicated with the President (Sir A. Brady), who had promised to communicate with Sir P. C. Owen, but up to the present time he had no intimation of anything having been effected.

Mr. Blanchett said that the statement that this show was to be held in Hyde Park he believed to be incorrect. It was, he understood, to be held at Willesden.

Mr. M. Zingler said he had learned that Sir P. C. Owen had nothing officially to do with the matter; and it transpired in the course of the discussion that the exhibition was one promoted by the Royal Agricultural Society, and was not a Government affair.

The Secretary was directed to proceed further with the matter, and the subject dropped, the President, the Secretary, and Mr. Zingler being requested to obtain further information.

The subject of the New Patent Law Amendment Bill, brought forward in the House of Commons by Mr. Anderson in conjunction with Mr. Mundella, Mr. Dalrymple, and Mr. Alexander Brown, was then brought under discussion; and it was resolved that although the Bill was not a measure of general reform such as was needed, yet, as a step in the right direction, the support of the Institute ought to be given to it.

Monthly Notices.

Colliery Explosions, as to which the Home Secretary of State, after consulting the President of the Royal Society, appointed a committee, have now become the subject of a Commission, which has been approved by the Queen, consisting of Mr. Warington W. Smyth, F.R.S., Sir George Elliot, M.P., Mr. F. A. Abel, C.B., Mr. Thomas Burt, M.P., Mr. Robert Bellamy Clifton, F.R S., Prof. Tyndall, F.R.S., Mr. Lindsay Wood, and Mr. W. Thomas Lewis. This Commission is appointed for the purpose of inquiring and reporting whether, with respect to the influences of fluctuation of atmospheric pressure upon the issue of fire-damp from coal, the adoption and efficient application of trustworthy indicators of the presence of fire-damp, and generally the introduction of air in mines, improved methods of ventilation and illumination, the employment of explosive agents in the getting of minerals, and other particulars relating to mines and mining operations, the resources of sciences furnish any practicable expedients that are not now in use, and are calculated to prevent the occurrence of accidents or limit their disastrous consequences.

Nitrogen, M. Cailletet informs the Academie des Sciences, is compressed at first more than is in accordance with Mariotte's law, and that subsequently its compressibility decreases. Nitrogen presents this curious maximum, at about the pressure of seventy metres of mercury.

Death of Mr. P. Le Neve Foster.—We regret to have to record the death of Mr. P. Le Neve Foster, the Secretary of the Society of Arts, which took place suddenly at his residence, Wandsworth, on February 20th. The deceased gentleman was born in 1809, and was educated at Norwich Grammar School, prior to studying at Cambridge, where he took his degree in 1830. A few years afterwards he was called to the bar, and after working zealously with the late Prince Consort to promote the success of the Exhibition of 1851, was appointed Secretary to the Society of Arts in 1853, which position he held until the day of his death. The deceased had lately been suffering from an acute attack of gout, but had sufficiently recovered to resume his labours. On Friday he left the offices of the society in apparent good health and spirits, but shortly after reaching home some member of his family found him lying dead on the floor of his drawing-room. A medical man had certified the death to be due to fatty degeneration of the heart. A short time since his large circle of friends formed a committee for the purpose of presenting him with a testimonial on the completion of his twenty-fifth year of service to the Society of Arts. About £1200 has already been subscribed, and it is now proposed to to increase that sum for the benefit of Mrs. Foster.

The decease of Mr. B. Woodcroft, formerly Superintendent of Specifications and Clerk to H.M. Commissioners, is announced as having occurred on the 7th inst., at the age of seventy-six years. The deceased gentleman was the inventor of " Woodcroft's tappets," which were largely used in some varieties of looms, and some other contrivances of considerable merit. He was the author of the well-known " History of Steam Navigation," and the editor of the curious and remarkable " Treatise of Hero of Alexandria on the Early Engines." Mr. Woodcroft was more generally known by the active part which he took in securing an improvement of the British Patent Law and the passing of the Patent Law Amendment Act in 1852. Under that Act Mr. Woodcroft held the most important position in the Patent Office, and to him the public are indebted for the Patent Office Free Library and for the cheap printed copies of all the specifications filed since A.D. 1600. His exertions to secure the free admission of the public to the Patent Museum before its removal to the South Kensington Museum are well known. Mr. Bennet Woodcroft was elected a Fellow of the Royal Society in 1859. He was, beyond question, the best authority on the history of inventors and inventions, and was a diligent collector of the portraits of discoverers and men of science.

A fire-damp apparatus, of a portable character, has been introduced by M. Coquillion, under the name of "grisoumetre," for indicating accumulations of fire-damp. It is founded upon the fact that a red-hot platinum wire decomposes light carburetted hydrogen in presence of steam. A coil of this wire is heated by a small electro-magnetic pile, and the rate of decomposition, indicated by the glow of the wire, becomes the measure of the quantity of gas in the air of the mine.

The Scientific Review.

MARCH, 1879.

ANOTHER ATTEMPT TO ALTER THE PATENT LAWS.

OUR present Government has, it appears, at length found time, notwithstanding the pressure of the Eastern Question, Cyprus settlement, and the Zulu War, to revert to such a practical national question as the law for promoting the progress of industrial improvement, known as the Patent Law; the Attorney-General having brought forward, in the House of Commons, "a Bill to consolidate with amendments the Acts relating to Letters-Patent for inventions."

This Bill has only just been printed (the order for printing being dated 17th February, 1879), and therefore we have not had time to examine it as minutely as we could wish. In many respects it is the same as the Bill presented to the House of Commons by the Attorney-General in 1877, a synopsis of which was published in the SCIENTIFIC REVIEW for March, 1877. It proposes to render a Patent liable to be *revoked* because the patentee has not put in practice his invention *within three years*, and has the same provisions as to *compulsory licenses* as in the former Bill. The Bill also confers power on the Commissioners of Patents to require the *deposit of models*, which would cast a burden on inventors heavier to be borne than the present high scale of charges. Many of the other objectionable features of the Bill of 1877 are preserved. It differs, however, in *expunging* the provisions in the former Bill as to the *examiners* and their action. The schedule of fees seems to be very similar to that in the Bill of 1877, viz., £2 10s. on application, £10 on sealing, £50 before the end of three years, £100 before the end of seven years, and £100 before the end of twelve years (the patent being extendable to twenty-one years). The following is a statement of the heads of the Bill:—

After repealing enactments now in force (1, 2, 3, 4), and setting forth an interpretation clause, &c., Clause 5 authorises five non-official Commissioners to be added to the Patent Commission.

Clause 6 regulates the mode of making application for a Patent, which is to be pretty much of the same character as that practised under the Act now in force; except that the *complete specification* is to be filed *before sealing*, and opposition can be founded thereon.

The principal points in this Bill are stated in a "Memorandum" which precedes it as follows:—

"Additional unpaid commissioners (cl. 5). Extension of provisional protection to twelve months (cl. 7). Publication of complete specification three months at least before end of provisional protection (cl. 8, 9). Opposed cases referred to law officer (cl. 10). Appeal by petition to Lord Chancellor against law officer's report (cl. 13). Any person may oppose sealing (cl. 14). Extension of term to twenty-one years (cl. 16), power of prolongation by Judicial Committee being abolished by repeal by Bill. Relief on accident, mistake, or inadvertence preventing payment in due time of periodical stamp duty (cl. 16). Large power of amendment before and after sealing (cl. 17). Improved procedure as to disclaimers and alterations (cl. 17). Binding of Crown, with power for contractors to use, on terms (cl. 18). Compulsory use or licensing (cl. 19). Abolition of *scire facias* (cl. 23). Abolition of communications from abroad, and regulation of patents for imported inventions (cl. 24). Power for law officer to take evidence on oath (cl. 30). Power for Lord Chancellor to appoint Judge of High Court to hear patent petitions (cl. 33). Proper particulars of objections or of breaches required in all cases (cl. 31). Experts (cl. 36). Large powers to regulate procedure by general orders (cl. 39), and office practice by general rules of commissioners (cl. 44). Patent Museum provided for (cl. 44*f*)."

"Observations" are printed with the Bill, which state:—

"Cl. 2. Commencement of Act is to date from end of 1879; but under clauses 5, 39, 44, additional commissioners may be appointed and general orders and general rules be made, on passing of Act, before commencement.

"Cl. 15 (5) Patents will not extend to the colonies; the colonies having their own systems.

"Cl. 16 (2). The twelfth year is taken, instead of the fourteenth, for payment of the last stamp fee, in order that the public may have long notice of the patentee's intention to renew beyond the fourteen years.

"Cl. 16 (3). There have been many cases of loss of patents from the causes here mentioned. There have been several instances of private Acts of Parliament obtained to restore patents thus lost (with proper savings). When indulgence is granted under this provision the patentee will have to pay an additional fee of £5 or £10 (2d Schedule). It will no longer be necessary for the patentee, on renewing, to produce the letters patent themselves or a duplicate thereof; the stamp will be put on the certificate of renewal, which will be issued at the Commissioners' office.

"Cl. 17 (1). At present reasons are given for disclaimer only. Amendment by way of supplement is new, and will probably get rid of the considerable proportion of separate patents now taken out for small improvements which are invented in the course of the use of the patented invention.

"Cl. 19. The object is to prevent patentees from monopolising privileges while not using them for the benefit of the community.

Schedule 1 contains a list of seven existing Acts which will be repealed under the Bill. All, excepting 5 and 6 William IV., chap. 83, are statutes of the present reign.

We hope this Bill will not be suffered to pass without overhauling, for there are many points of it which are of a most unsatisfactory character, and that Mr. Anderson's Bill, now before the House of Commons, will be considered before legislative action is effected.

Proceedings of Societies.

ROYAL SOCIETY.

JAN. 23TH.—W. Spottiswoode, Esq., MA., President, in the chair.—The following papers were read:—"Researches on Chemical Equivalence, Part I. Sodic and Potassic Sulphates," by Dr. Mills and Mr. T. W. Walton; "Researches, Part II.," and "Researches on Lactin," by Dr. Mills and Mr. J. Hogarth; "On the Microrheometer," by J. B. Hannay; "Limestone as an Index of Geological Time," by Mr. T. M. Reade; and "Preliminary Note on the Substances which produce the Cromospheric Lines," by Mr. J. N. Lockyer.

JAN. 30TH.—W. Spottiswoode, Esq., M.A., President, in the chair.—The following papers were read:—"On the Effect of Heat on the Di-iodide of Mercury HgI_2," by Messrs. G. F. Rodwell and H. M. Elder; "A Comparison of the Variations of the Diurnal Range of Magnetic Declination as recorded by the Observations of Kew and Trevandrum," by Messrs. B. Stewart and Morisabro Hiraoka; "On the Determination of the Rate of Vibration of Tuning Forks," by Mr. H. M'Leod and Lieut. G. S. Clarke; and "On certain Means of Measuring and Regulating Electric Currents," by Mr. C. W. Siemens.

FEB. 6TH.—W. Spottiswoode, Esq., in the chair.—The following papers were read:—"On certain Dimensional Properties of Matter in the Gaseous State," by Prof. O. Reynolds; and "Absorption of Gases by Charcoal, No. II. A new Series of Equivalents or Morecules," by Dr. A. Smith.

FEB. 13TH. — W. Spottiswoode, Esq., D.C.L., President, in the chair.—The following papers were read: "Note on the Development of the Olfactory Organ of Vertebrates," by Dr. M. Marshall. "On the Development of the Skull and its Nerves in the Green Turtle (*Chelone Midas*), with Remarks on the Segmentation seen in the Skull of various Types," by Prof. Parker; and "Experiment showing an Extension of the Phenomena discovered by Dr. Kerr, and described by him under the title of a New Relation between Electricty and Light," by Mr. J. E. H. Gordon.

GEOGRAPHICAL SOCIETY.

JAN. 27TH.—Sir R. Alcock, V.P., in the chair. — The following gentlemen were elected Fellows:—Sir A. D. Scott, Lieut.-Col. B. Deane, Lieut.-Col. A. B. Wavell, Lieut. C. W. Baillie, Lieut. L. S. Dawson, Lieut. F. A. Spuhler, Right Rev. H. Vaughan, Rev. J. C. Bates, Rev. G. M. Gordon, Rev. T. Mann, Messrs. A. A. Annesley, F. C. Carr-Gomm, W. E. Crothers, P. S. Dowson, J. Frazer, F. W. Isaacson, F. J. Keeling, W. F. Laxton, A. W. Maberly, O. Phibbs, A. E. Pirkis, A. T. Simpson, R. Thornley, and T. A. Yarrow. The paper read was "The Road to Merv," by Major-Gen. Sir H. C. Rawlinson.

FEB. 10TH.—Right Hon. the Earl of Dufferin, President, in the chair.—The following gentlemen were elected Fellows: Rev. J. C. May, Messrs. J. J. Carey, C. H. Eden, S. Gedge, F. W. Isaacson, G. Quin, C. E. Solomon, E. Street, R. White, A. White, and R. G. Webster. The papers read were:—"Exploration inland from Mount Cameroons, and Journey through Congo to Makuta," by Mr. T. J. Comber," and "The Bamangwato Country, South Africa," by (the late) Capt. Patterson.

GEOLOGICAL SOCIETY.

JAN. 22ND.—H. C. Sorby, Esq., President, in the chair.—Mr. J. E. Marr and Lieut. H. T. Wing were elected Fellows. The following communications were read: "On Community of Structure in Rocks of Dissimilar Origin," by Mr. F. Rutley; and "Distribution of the Serpentine and Associated Rocks, with their Metallic Ores, in Newfoundland," by Mr. A. Murray.

FEB. 5TH.—H. C. Sorby, Esq., President, in the chair.—Messrs. A. E. Baldwin, J. Farie, and B. N. Peach were elected Fellows. The President announced the receipt of a legacy of £1000, bequeathed to the society by the late Sydney Ellis, Esq., of The Park, Nottingham. The following communications were read:—"On the Occurrence of Pebbles with Upper-Ludlow Fossils in the Lower Carboniferous Conglomerates of North Wales," by Messrs. A. Strahan and A. O. Walker; "On a New Group of Pre-Cambrian Rocks (the Arvonian) in Pembrokeshire," by Dr. H. Hicks, with an appendix on their Microscopic Structure by Mr. T. Davis; "On the Pre-Cambrian (Dimethian, Arvonian, and Pebidian) Rocks of Caernarvonshire and Anglesey," by Dr. H. Hicks, with an appendix on their Microscopic Structure by the Rev. Prof. T. G. Bonney; "On the Quartz-felsite and Associated Rocks at the base of the Cambrian Series in North-western Caernarvonshire," by the Rev. T. G. Bonney; and "On the Metamorphic Series between Twt Hill, Caernarvon, and Port Dinorwic," by the Rev. Prof. T. G. Bonney and Mr. F. T. S. Houghton.

SOCIETY OF ANTIQUARIES.

JAN. 23RD.—Dr. W. Smith, V.P., in the chair.—The Rev. J. Baron exhibited a full-sized drawing of a large slab, about six feet long and twenty inches in height, which was found in 1857 in pulling down the London Inn, Westminster. It was in two pieces, built into the wall in two different places, the carved side turned inwards. The surface was divided into five compartments, containing the following heraldic devices:—1. A tilting helmet with drapery behind terminating in a tassel, surmounted by a cap of estate, and thereon a lion statant gardant. 2. Party per pale, three lions, two above one, passant to sinister gardant counterchanged. 3. On a chevron, between three faces of leopards or lions, as many mullets. 4. A coat divided quarterly, four lions rampant. 5. A tilting helmet surmounted by a coronet and the face of a leopard or lion; small shield defaced. Mr. A. W. Franks remarked that the execution of the carving seemed too coarse to have formed, as had been conjectured, the side of a tomb: it had probably been placed over a doorway, so as to be seen from a distance. The attribution of the various coats seemed somewhat obscure. Date, early fourteenth century. The Rev. J. T. Fowler exhibited a cast and a rubbing of a sculptured tympanum of a doorway at South Ferriby church. This very very curious stone—probably of the twelfth century—represented a bishop (? St. Nicholas, to whom the church was dedicated), holding in one hand a very primitive pastoral staff, and with the other, as it would seem, giving the benediction. On each side of the head was a small circular device, like stars with rays or wheels with spokes. On each side of the lower part of the figure is a large cross formed within a circle. Mr. Fowler's description of this curious sculpture was followed by an elaborate and exhaustive paper by Mr. C. T. Keyser, who brought together a large number of examples of early tympana of doorways of churches in England which he had personally examined. Mr. Keyser believed that the symbolism of the sculpture had a double significance; first, a special blessing by the patron saint to the church dedicated to his honour, and secondly, a reference to the adoration of the cross, as represented on many other examples. Mr. H. M. Westropp communicated a paper on what he believed to be the northern origin of the tomb of Mycenæ. The conclusions at which he had arrived were controverted at some length in the discussion which ensued, and in which Mr. A. W. Franks, Mr. W. Lloyd, and the secretary took part.

JAN. 30TH.—Dr. W. Smith, V.P., in the chair.—The Rev. J. Beek exhibited an Oriental cup and cover of old Armenian work, the bowl of polished steatite or soapstone, mounted in silver, on a dwarfed stem. The cover and stem were covered with filigree scrolls, the field partly filled in with different coloured enamels. The Rev. J. T. Fowler exhibited a tracing of a figure of a priest, in vestments, from a wall painting recently discovered in Newminster Abbey. Mr. J. Evans exhibited impressions of a very curious pointed oval silver seal of Joanna, Queen of Sicily, daughter of Henry II. of England, accompanied by a memoir of that lady and a description of the seal. On the one face is the standing figure of the Queen in a long robe, confined at the waist. Over her shoulders is a long mantel descending to her feet, and which is carried over the chest by a double cord, through which the right hand is passed. In the left hand is a short sceptre, ending in a fleur-de-lys. On her head is a crown showing three crosses with fleurée terminations. The legend around is S. REGINÆ IOH'E FILIE QUONDAM II. REGIS ANGLORUM. The other face represents the Queen seated, facing, on a faldstool, on which is a quilted cushion, She is draped as before described, but her cloak is gathered on her knees. Her left hand is on her bosom; in her right she holds the peculiar open cross of Toulouse. The legend is S. IOH'E DUCISSE NARB. COMITISSE THO. MARCHISIE PROV. This portion of the seal may have been used during the life of her second husband, the Count of Toulouse, who bore also the titles of Duke of Narbonne and Marquis of Provence. Mr. E. MacCulloch communicated an account of discoveries recently made in the church of Sainte Marie du Castel, Guernsey. The most curious of these discoveries was that of a huge stone, somewhat in the shape and the dimensions of a mummy case, which was roughly hewn into the appearance of a female deity, probably an idol worshipped by the old pagan inhabitants of the island.

FEB. 5TH.—C. D. E. Fortnum, Esq., in the chair.—Mr. C. K. Watson, secretary, said it was his painful duty to announce to the society the death of one of their valued Fellows, Mr. W. S. Walford, which had taken place that afternoon. Mr. Walford's communications on heraldry and seals, and other cognate antiquarian subjects, in the *Transactions* of this Society and in the *Journal* of the Archæological Institute, were models and masterpieces of accurate enquiry and consummate learning. Mr. W. H. H. Rogers communicated a paper on the Courtenay effigy at Cloyton Church, Devon, which had for years been known as the effigy of Margaret Courtenay, called "little Choke-a-bone," from the tradition that she died from a fish-bone sticking in her throat. For the correct attribution Mr. Rogers was indebted to Mr. Walford, who had suggested that one of the coats behind the tomb which has been taken for Courtenay impaling France and England would prove on closer examination within a bordure. Mr. Walford's conjecture turned out correct, and the coat was thus shown to be a Beaufort coat, and the effigy to be that of one of the three unmarried (Anne, Matilda, and Eleanor) of Thomas Courtenay (*ob.* 1458), Earl of Devon, who married Margaret, daughter of John Beaufort, Earl of Somerset, eldest son of John of Gaunt. Dr. Kelter communicated a paper on some remarkable tumuli in Aargau, accompanied by drawings of the objects found, viz., armlets of bronze, bronze spirals, an ornamental girdle and ear-pendants, a pair of spindle whorls, a rust-eaten two-edged sword, a broken iron crescent, an agate ring, an urn with zigzag ornaments, a pair of silver bracelets, two little bronze figures (phallic), and two curious little bronze feet for suspension, a small pin, and two rings o amber. Mr. F. Haines communicated a paper on three New Years' Gifts Rolls of Queen Elizabeth, gifts given to her and by her on New Year's Day. The three rolls exhibited by Mr. Haines are all of them different from those printed by Nichols in his "Progress of Queen Elizabeth." Mr. Haines gave a history of this class of documents in successive reigns, and called attention to the items of special interest in the rolls exhibited, which were found about forty years ago in a drawer of a piece of furniture in Serle's coffee-house, at the corner of Serle street and Portugal street.

ROYAL SOCIETY OF LITERATURE.

Jan. 22nd.—W. Knighton, Esq., in the chair.—Capt. R. F. Burton read a paper "On the Ogham Inscriptions and the Mushajjar Characters," in which he discussed at great length the various views which have been held on these subjects, and maintained the probable, if not the necessary, connection between these Eastern and the Western writings. A discussion took place, in which the Chairman, Mr. Highton, Mr. Brabrook, and other gentlemen took part.

Feb 12th.—Sir P. de Colquhoun, V.P., in the chair.—Mr. J. W. Redhouse read a paper "On the History, System, and Varieties of Turkish Poetry, illustrated by Selections in the Original and in English Paraphrase." Mr. Redhouse commenced by stating that the poetry of modern European nations, owing to the predominant study of the classical writings of Greece and Rome, is cast in one unvarying mould, with the same myths and imagery, and a similar system of rhymes and metres. Hence it differs essentially from what we find enshrined in the Sanskrit, Hebrew, Arabic, and Persian writings. The Turks, Mr. Redhouse added, had not been less successful than other Oriental peoples in the cultivation of poetry, many of their works having been studied by European writers, and notably by Von Hammer. Many, too, of the Turkish Sultans, as Mahommed II., Bayazid II., Selim, and recently Abdul Aziz, have been remarkable for their poetical skill. Mr. Redhouse then read several extracts in the original Turkish, with translations in English, from Turkish poems composed by Izzet Molla, Fuad Pasha, &c., and showed clearly that the Ottoman Turks are not, as they have been sometimes, and even recently, stated to be, ignorant barbarians, devoid of intellectual culture; but, on the contrary, that they have had, before and since the foundation of their empire, a body of learned men of letters, with a voluminous literature in poetry, history, science, and fiction.

ENTOMOLOGICAL SOCIETY.

Jan. 15th.—Anniversary Meeting.—H. W. Bates, Esq., in the chair.—The following gentlemen were elected as officers for the ensuing year:—President, Sir J. Lubbock, Bart.; Treasurer, J. J. Weir; Librarian, F. Grut; Secretaries, R. Meldola and W. L. Distant; other members of the Council, H. W. Bates, Rev. A. E. Eaton, E. A. Fitch, R. Saunders, J. W. Dunning, S. Stevens, and J. W. Mason. The retiring President delivered an address.

Feb. 5th.—Sir J. Lubbock, Bart., President, in the chair.—Messrs. H. W. Bates, J. W. Dunning, and F. Smith were nominated vice-presidents for the ensuing year. Mr. H. J. Elwes exhibited a collection of Lepidoptera from a small island at the mouth of the River Amur. Mr. Waterhouse exhibited a remarkable spider from West Africa, *Gasteracantha Cambridgii*, Butl. A specimen of *Harpalus oblonguisculus*, taken at Weymouth, was exhibited by Mr. Champion. The Rev. A. E. Eaton remarked on the peculiarities in the neuration of the wings of most of the Ephemeridæ, and exhibited drawings of wings of Trichoptera and Tineina, to show the homologies in the neuration of the same. The Secretary read a note from Dr. Fritz Müller recording a remarkable case of mimicry in the Brazilian butterfly *Eueides pavana*, which mimics *Acræa Thalia*. It is, however, in the male sex of *E. pavana* that the greatest resemblance to the Acræa is found. The following papers were communicated: "On the Lepidoptera of the Amazons, &c., Part III. Noctuites,' by Mr. G. A. Butler; "Description of a New Genus of Rhyncophorus Coleoptera," by Mr. C. O. Waterhouse; and "Descriptions of the Species of the Lepidopterous Genus Kallima," by Mr. E. Moore.

QUEKETT MICROSCOPICAL SOCIETY.

Jan. 24th.—Prof. Huxley, President, in the chair.—Ten new members were elected.—A paper by Mr. F. A Bedwell, "On the Urticating Threads of *Actinia parasitica*," was read by Mr. T. C. White. A discussion followed upon the probable nature of the stinging property of the organism, the President expressing his opinion that it was certainly not electrical, but was probably due to the extremely fine character of the spines which penetrated the skin, aided by an irritant poison discharged at the same moment. Mr. E. T. Newton read a paper "On a New Method of Preparing a Dissected Model of an Insect's Brain from Microscopical Sections."

PHOTOGRAPHIC SOCIETY.

Jan. 14th.—J. Glaisher, Esq., in the chair. Capt. Abney read a paper "On the Fading of the Undeveloped Photographic Image, and on Soluble Bromide in Emulsions," and Col. Wortley explained a new instantaneous shutter designed by him.

ANTHROPOLOGICAL INSTITUTE.

Jan. 21st.—Mr. J. Evans, President, in the chair.—The Director read a communication from Dr. P. Topinard "On Resemblances between a Galtcha and a Savoyard Skull." The similarity between these skulls is such that the author is inclined to regard the Galtchas of Eastern Turkistan and the Celts of Western Europe as branches of one common stock, of which the Slavs of Eastern Europe are also members. M. E. Reclus read a paper "On Circumcision, its Significance, its Origin, and its Kindred Rites."

Jan. 28th.—Anniversary Meeting.—Mr. J. Evans, President, in the chair.—The election of of Mr. A. H. Keene as a member was announced. The following gentlemen were elected to serve as officers and Council for 1879:—President, E. B. Tylor; vice-presidents, Hyde Clarke, J. Evans, Prof. Flower, Major-Gen. A. L. Fox, L. Galton, and Prof. Rolleston; directors and hon. secs., E. W, Brabrook, W. L. Distant, and J. E. Price; treasurer, F. G. H. Price; council, Lieut.-Col. Austen, Dr. J. Beddoe, Prof. G. Busk, C. H. E. Carmichael, Dr. J. B. Davis, W. B. Dawkins, Captain H. Dillon, A. W. Franks. J. P. Harrison, Prof. Huxley, A. L. Lewis, Sir J. Lubbock, Bart., R. B. Martin, F. W. Rudler, C. R. Des Ruffieres, Lord A. Russell, Rev. Prof. Sayce, Dr. A. Thomson, C. S. Wake, and M. J. Walhouse. The retiring President delivered his annual address, in the course of which he alluded to researches new being carried on in the caves of Borneo by Mr. Everett. That gentleman commenced his labours last October, and has already made more or less extensive excavations in several caves, the principal proceeds from which are now on their way to this country. From Mr. Everett's first quarterly report, only just received, the discovery is announced of numerous mammalian remains, the age of which has still to be determined, and also of remains of a race of men of whom no local tradition seems to be extant, and who habitually used the caves of Upper Sarawak either as domiciles or as places of sepulture, or possibly for other purposes. Mr. Evans stated that he should be happy to still receive subscriptions to this exploration fund.

Feb. 11th.—Prof. W. H. Flower, V.P., in the chair.—The election of Sir H. S. Maine as a member was announced. Prof. W. H. Flower exhibited and described a scaphocephlic cranium from Fiji, and Mr. A. Lewis exhibited a series of implements and photographs from Australia. Mr. John E. Price read a paper by Mr. D. Macallister "On the Australian Aborigines." After describing their social and domestic observances, traditions, and religious notions, the author declared that he had no doubt that had the continent of Australia remained undiscovered by Europeans for a few years longer, the climatic and general physical changes which would doubtless have occurred, together with the contact at intervals with their more civilized Polynesian neighbours, would have constituted an environment more favourable to progress than any which has ever existed and would also have tended to an improved condition of the people. As it was, the total absence from the continent of ferocious or powerful animals, the comparative ease with which the poor and limited quantity of their food was obtained, and their national isolation may have been a powerful cause for the non-progressive character of the people. A paper by Capt. W. E. Armit was also read by the Director "On Customs of Australian Aborigines."

PHYSICAL SOCIETY.

Jan. 25th.—Prof. G. C. Foster, V.P., in the chair.—Prof. E. Ray Lankaster and Mr. A. Macdonald were elected members. Dr Erck exhibited a constant bichromate of potash battery. Dr. Erck also showed a battery formed of zinc and carbon circular plates mounted on an axle. Dr. F. Guthrie described some of the results he had obtained from Experiments on the vibration of metal rods or laths fixed in a vice at one end and free to vibrate at the other. Messrs. Elliott Brothers exhibited sundry electric commutators and resistance boxes.

Feb. 8th.—Annual Meeting.—Prof. W. G. Adams, President, in the chair.—The President read the report of the council, which showed that the papers had been more numerous during the past than any previous year, and that their value and interest had been well sustained. A copy of the collected papers of the late Sir C. Wheatstone was laid on the table, and the work will shortly be issued to the members of the society. The President then gave a brief review of the physical work of the past year, dwelling more especially on the papers read at the meetings. The following were elected as council and officers for the ensuing year:—President, Prof. W. G. Adams; vice-presidents, Prof. G. C. Foster, Prof. R. B. Clifton, Lord Rayleigh, Dr. S. Spottiswoode, and Sir W. Thomson; secretaries, Prof. A. W. Reinold and W. Chandler Roberts; treasurer, Dr. E. Atkinson; demonstrator, Prof. F. Guthrie; other members of council, Capt. W. de W. Abney, Dr. Warren De La Rue, Major E. R. Festing, Prof. Fuller, Dr. Huggins, Prof. A. B. W. Kennedy, Prof. M'Leod, the Earl of Rosse, Mr. G. J. Stoney, and Dr. Wormell; honorary members, Prof. G. R. Kirchoff and Dr. J. Plateau. The meeting was then resolved into an ordinary one, and Dr. O. J. Lodge read a paper on the method of calculating the curve of temperature in a rod along which heat is being conducted. Mr. Shoolbred gave an account of electric lighting, illustrated by diagrams of the most recent magneto- and dynamo-electric machines and eaxmples of the lamps in vogue.

ASIATIC SOCIETY.

Feb. 3rd.—Sir H. C. Rawlinson, President, in the chair.—Mr. E. A. Budge and Mr. R. Joyner were elected resident members. Messrs. Fergusson and Cust read papers respectively "On the Identification of the portrait cf Chrosroes, King of Persia, in the Caves of Ajanta," and "On a map of the Central Provinces of India." In the first Mr. Fergusson described, from drawings made by Mr. Griffiths of Bombay (and now in the Indian Museum at South Kensington), scenes painted on the ceiling, or in fresco on the walls, of one the caves; in the former of these he believed he could recognise the Persian king and his celebrated wife Shirin; and in the latter an Indian king (perhaps Pulakesi) on his throne, receiving an embassy of persons, obviously Persians, who bear a letter and receive from the king in return various presents. The evidences in favour of this view are the dresses of the Persian king and queen and of some of the figures of the embassy scene, together with many notices which Mr. Fergusson quoted from Oriental writers, proving a close connection and intercourse between the rulers of Persia and of India during the latter portion of the reign of Chosroes, A.D. 610-28. In the second Mr. R. Cust exhibited a Language-Map of the Central Provinces of British India, specially prepared by the Education Department, and explained the way in which the languages and the dialects of the languages spoken there were interlaced, there being within this area no less than eight languages—Hindi, Uriga, Marathi, Gujarati, Telugu, Gond, Khond, and Kurku, and four dialects, Mimari, Chutesgurhi, Bhil, and Bingwari.

Feb. 17th.—Sir H. C. Rawlinson, President, in the chair.—The following were elected as resident members: Messrs. M. Low, A. Faulkner, J. Abrahams, the Rev. E. T. Gibson, and Miss Glendinning; and as non-resident, Mr. W. G. Aston. Prof. Legge read his second paper "On the Principles of Composition in Chinese as deduced from the Written Characters." Having referred briefly to his former paper, on the 20th ult., when he treated of the structure of the characters and of the ancient style of composition, the Professor proceeded to deal with the polished or literary style, the Mandarin, colloquial, and the purely vernacular speech of the different dialects. With this object in view, he exhibited the general characteristics of these different methods of composition, showing how the rhetorical processes employed both in writing and speaking compensated for the absence of inflexions, and how the unchangeable ideograms were made to convey thought as deftly and as effectually as the words of an alphabetic language. The rule first enunciated by Dr. Marshman, "that the whole of the Chinese grammar depends on position," was shown to be only partially true; in fact, that students of Chinese and philologists generally must get rid of the idea that there was anything corresponding with Aryan or Semitic grammar in Chinese. Rules, no doubt, there were, and these are not difficult to understand and master. Indeed, one could learn to translate Chinese and to compose and speak in it sooner than many other languages could be as completely acquired. The view of Chinese presented in the two papers, if not entirely new, was the carrying out further than had been previously done of facts now generally recognised with reference to the structure of the written characters.

LINNEAN SOCIETY.

Jan. 16.—W. Carruthers, Esq., V.P., in the chair.—Messrs. G. Brook, A. P. Luff, J. E. Griffiths, C. Sharp, and J. Woodland were elected Fellows. Mr. Christy in some observations referred to the Chalmugra tree (*Gynocardia odorata*), its therapeuticel properties being highly extolled, especially in rheumatism. Mr. J. G. Baker read a paper 'On the Colchicaceæ and Aberrant Tribes of Liliaceæ." Colchicaceæ is the smallest of the three sub-orders of Liliaceæ; it includes thirty-nine genera and 153 species. Its geographical dispersion agrees completely with the true Liliaceæ. In its typical form it is marked by extrorse anthers, a cepticidal capsule, and three distinct styles; but as twenty-four out of thirty-nine genera do not possess all these three characters in combination, but recede more or less decidedly from the type in the direction of true Liliaceæ, it seems injudicious to follow those who have proposed to keep up Colchicaceæ or Melanthaceæ as a distinct natural order. Mr. Baker defines seven tribes, Colchiceæ, Merenderæ, Veratreæ, Anguillarieæ, Helonieæ, Uvularieæ, Tofieldieæ. There are several anomalous genera of the Colchicaceæ; for instance, Hewardia, which connects the Liliaceæ with the Iridaceæ. Again, there are three aberrant tribes Liliaceæ, viz., (1) Conantheræ, a connecting link between Liliaceæ and Amaryllidaceæ; (2) Liriopeæ (formerly Ophiogon); and (3) Gilliesieæ—genera among the latter two receding widely from the liliaceæous type, and others bridging over the interval between the extreme form and the ordinary lies. The author then enters into lengthened descriptions of genera and species of the Colchicaceæ with ample diagnosis, &c., forming, in fact, a valuable continuation of his former series of monographs on the natural order Liliaceæ.

Feb. 6th.—Prof. Allman, President, in the chair.—Mr. J. R. Jackson exhibited specimens from the tombs of Thebes. Among these are fruits of the Doum Palm (*Hyphæne Thebaica*) and of *H. aigun*, formerly, but wrongly, described as an areca. Small berries obtained were identified as those of *Juniperus Phœnicea.* Mr. J. G. Baker showed dried bulbs of *Buphans toxicaria*, which furnish a principal ingredient of the poison the Bushmen tip their arrows with. Mr. W. T. Thiselton Dyer gave a description of the chief features of a new fodder grass, and he exhibited and explained a curious instrument used by the inhabitants of Borneo for weaving the fibre of *Curculigo latifolia*. Mr. T. Christy drew attention to a sample of tea grown in Natal, and to a bottle of the milky juice of the Arabian rubber tree as freshly drawn, uncorked, and immediately thereafter forwarded to this country. There nevertheless was a tendency to coagulation of the fluid. The Rev. G. Henslow passed round for examination a specimen of a female mistletoe bearing male shoots. The botanists present expressed opinion of its being an androgynous condition rather than a male parasitic on a female plant, as had been supposed. A short paper "On the Systematic Position of the Genus Sequenzia," was read by Dr. G. Gwyn Jeffreys. Sir John Lubbock then read two papers on Ants, one devoted to their anatomy, the other to their habits. He finds that instead of using water for isolation, fur arranged with the hair-points downwards better answers the purpose, and he recommends this plan to parties resident in hot countries where ants are troublesome. Contrary to what has been stated, the workers (besides the queen) occasionally lay eggs, and these always produce males. Ants possess domestic servants, a curious blind beetle, Claviger, residing in some nests, though the ants are not all on a level of intelligence sufficient to keep Clavigers. Sir John has two queens of *Formica fusca*, five years old and in good health, and also workers of different species some four years in his possession. Though previously he has shown instances of ants using their friends badly, yet to their credit be it said that ants of the same nest never quarrel nor are ill-tempered among themselves. An instance was given of an ant without antennæ losing her way, being attacked by an enemy, and afterwards tenderly relieved by a good Samaritan. From the experiments recorded it would seem that ants recognise fellows of the same nest, but where, as in some cases, there are 100,000 individuals, it seems incredible they should recognise each other at sight, nor is it likely that peculiarities pertain to those of each nest. Have they signs or password? Endeavouring to throw light on this difficult question, Sir John experimented on the pupæ. Although certain species are deadly enemies, yet their larvæ if transferred to one another's nests will be taken care of as if their own. In ant warfare sex is no protection, but the young are spared. Now if the recognition were effected by signal or password, the larvæ or pupæ would not be intelligent enough to appreciate and remember this, and on being returned to former nest when full-grown would carry the signal of the wrong nest. The results of such experiments on *Formica fusca* and *Lasius niger* were, among others, that thirty-two ants transferred from their nests pupæ, and again when older returned to their own nests, were all amicably received, from which it may be inferred no password obtains. These last observations, though interesting, require additional information and crucial experiment.

INSTITUTION OF CIVIL ENGINEERS.

Feb. 11.—Mr. W. H. Barlow, V.P., in the chair.—The monthly ballot resulted in the election of Prof. H. Tresca as an honorary member; of Messrs. J. Bell, R. Briggs, P. Burtchaell, E. Cousins, R. D. Ormsby, and C. Ward as members; of Messrs. C. G. Adames, C. C. C. Albeck, R. G. Alford, W. Anderson, W. H. Aubrey, W. E. Ayrton, C. E. de Bertodano, L. B. Blackwell, C. P. W. Bond, St. G. J. Boswell, E. E. Brice, B. W. Cantopher, G. B. Carlton, J. C. Chapman, G. Chatterton, W. P. Churchward, F. Couper, R. E. Creswell, G. Cucco, R. E. Dunston, A. G. Evans, J. F. Flannery, W. A. Francken, Hon. M. Fraser, A. R. W. Fulton, J. W. Girdlestone, C. Good, E. F. Gordon, H. E. Haddon, P. W. Hales, C. W. Harding, E. A. Hoare, C. W. Hodson, W. J. Hollingsworth, J. G. Hudson, W. Hughes, J. Hunter, jun., R. Isherwood, E. F. Jacob, J. P. Josephson, M. Labeeb Masjallam, E. D. Latham, J. J. Lee, R. K. Leigh, L. L. Macassey, A. A. Macgregor, J. MacLennan, T. de C. Meade, A. S. Moss, R. E. Norfor, W. T. Olive, E. M. Park, W. de W. Peel, S. M. Pipe, O. M. Prouse, F. T. Reade, T. Rees, R. Runeberg, D. S. de Saboia e Silva, T. Shann, W. Sharp, S. Shaw, G. A. G. Shawe, J. L. Sheldrick, J. B. Stanley, C. E. Straker, A. Sulivan, T. Sunderland, H. C. E. Vernon, R. Wallnutt. J. J. Webster, W. H. Wellsend, A. H. Wilson, and G. Winship as associate members; and of Messrs. H. R. H. Bigg, R. C. Carrington, E. Combes, J. Hall, F. H. Izard, F. M. Newton, G. H. Sumner, and W. Wyatt as associates. The papers read were "On the Geelong Water Supply, Victoria, Australia," by Mr. E. Dobson, and "On the Sandhurst Water Supply, Victoria, Australia, by Mr. J. Brady.

Feb. 18th.—Mr. Brunlees, V.P., in the chair.—The paper read was "On the Construction of Heavy Ordnance," by Mr. J. A. Longridge.

ROYAL INSTITUTION.

Feb. 3rd.—F. Busk, Esq., Treasurer and V.P., in the chair.—The Marquis of Blandford, Mrs. L. Lawrence, Mrs. Julia von Mumm, Major-Gen. C. Sawyer, and Mr. J. Mellor were elected members. Warren De La Rue, Esq, was elected secretary, and W. Spottiswoode, Esq., Manager.

SOCIETY OF ARTS.

Jan. 30th.—C. Woodall, Esq., in the chair. —A paper was read before the chemical section "On Gas Illumination," by Dr. Wallace. The paper was illustrated by various forms of gas-burners, among them being specimens of Sugg's 200 and 300 candle power Argand burners, similar to those now in use in the experimeents in gas illumination in the Waterloo Road.

Jan. 31st.—A. Cassels, Esq., in the chair. A paper "On Quest and Early European

Settlement in India" was read before the Indian section by Dr. G. Birdwood.

FEB. 3RD.—B. F. Cobb, Esq., in the chair. A lecture "On Further Researches in Putrefactive Changes" was delivered by Dr. Richardson, in continuation of the course given by him last year.

FEB. 4TH.—Col. Harley in the chair.—A paper "On the Opening of the District to the North of Lake Nyassa, with Notes of a recent Expedition through the Country." was read by Dr. Mann in the absence of Mr. Cotterill.

FEB. 5TH.—Sir C. Trevelyan in the chair. A paper "On the best Methods for Improving the condition of the Blind" was read by Dr. T. R. Armitage.

FEB. 10TH.—B. F. Cobb, Esq., in the chair.—The second and concluding lecture of his course "On Putrefactive Changes" was delivered by Dr. B. W. Richardson.

FEB. 12TH.—Prof. Roscoe in the chair.—Twelve candidates were proposed for election as members. A paper "On the Application of the Bessemer Process to the Reduction of Metallic Sulphides" was read by Mr. J. Hollway.

FEB. 13TH.—A paper "On Noxious Vapours, with special reference to the Report of the late Commission," was read before the Chemical Section by Mr. A. G. Phillips.

FEB. 17TH.—The first of a course of six lectures "On Dwelling Houses, their Sanitary Construction and Arrangements," was delivered by Dr. W. H. Corfield.

FEB. 19TH.—Lieut.-General Sir A. Kemball in the chair.—Seven candidates were proposed for election as members. A paper "On Turkish Resources and their ready Development" was read by Mr. J. L. Haddan.

SOCIETY OF ENGINEERS.

FEB. 3RD.—Mr. P. Spice, President, in the chair.—The premiums having been presented, the President delivered his inaugural address.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

FEB. 4TH.—Dr. S. Birch, President, in the chair.—The following were elected members of the society:—Countess d'Avigdor, Baron H. de Worms, Messrs. A. F. Buxton, M. Lugasy, and Dr. L. W. Schott; Ambrosial Library, Milan; Theological Seminary, New Brunswick; Theological Seminary, Rochester; John Hopkins, University Library, Baltimore. A memoir of the late Joseph Bonomi, by Mr. W. Simpson, was read. M. E. Revillout communicated a translation of the will of a Coptic monk, which will be printed in full in the next part of the *Transactions*.

BRITISH ARCHÆOLOGICAL SOCIETY.

FEB. 5TH.—Mr. H. S. Cuming in the chair. Mr. R. Blair exhibited a drawing of an elaborately worked helmet covering, of Roman date, discovered in the Tyne. Special examination was made of a collection of remarkable objects of small size, and which were professed to have been discovered at the excavations at the Roman station at the Lawes, South Shields. These belong to various owners, and, there being some some doubt as to their genuineness, they were kindly collected and sent by Mr. Blair for examination. A figure of a gorilla was carved on a small slab of jet-like substance, with the inscription, ELAIAS. Beneath a headless figure standing on its hands was "Insidiis Diaboli," while other letters appeared on other nondescripts. A great similarity of style was observed in the workmanship of all the articles, although very diverse in design and apparent age. The chairman denounced almost the entire collection as modern forgeries, and his opinion was supported by the meeting. Mr. L. Brock described a beautifully carved Roman monument, apparently sepulchral, recently discovered at Carlisle. The inscription is lost. It represents a female figure seated, with a child on her left side. She holds a circular fan, similar to those of modern use. Above the canopy of the enclosing niche are two small lions devouring human skulls—a design of which there are several examples elsewhere, which were passed in review. A paper by Sir L. Jarvis was read, descriptive of his mansion, Middleton Towers, near Lynn, which was followed by a second by Mr. S. Cuming on the "Beggar's Chicklet," or Clacker, being an alms-box with a noisy lid, and from which the now almost obsolete word "clack" was derived. The proceedings were brought to a close by the reading of a paper by Dr. Harker, who described some prehistoric discoveries at Morecambe.

ARCHÆOLOGICAL INSTITUTE.

FEB. 6TH.—The Rev. Sir T. Baker, Bart., in the chair.—Mr. R. S. Ferguson contributed a paper upon Roman remains recently found in Carlisle, with special reference to a remarkable monumental slab discovered at Murrell Hill, near that city. This represents a female holding a fan, seated in an alcove with a child at her side playing with a bird. Mr. W. T. Watkin sent a paper on Roman inscriptions found in 1878, in the course of which he gave a careful account of the Palmyrene monument found at South Shields in October last. Mr. A. Nesbitt sent some notes on horse-shoeing in Greek and Roman times. The meeting was further indebted to Mr. Ferguson for a paper on certain sepulchral slabs in Cumberland, some of which had a pair of shears sculptured upon them, another a harp, and others a sword and chalice. The much-vexed question of the meaning of the shears excited some discussion. Sir E. Kerrison exhibited a spear-head and sword of iron, a pair of prick-spurs, a horse-shoe and two stirrups, all found at Gold Brook, the hiding-place of Edmund, King of the East Angles, and whence he was taken by the Danes and shot with arrows in 870. The first two objects were apparently of this period, the rest being of the early part of the thirteenth century. It was announced that the annual meeting of the Institute will take place this year at Taunton, under the presidency of the Bishop of Bath and Wells.

MATHEMATICAL SOCIETY.

FEB. 13TH.—C. W. Merrifield, Esq., President, in the chair.—Sir J. Cockle was admitted into the society. Mr. R. Hargreaves and Prof. W. E. Story were proposed for election. Dr. Hirst communicated a paper by M. Halphen on the number of conics which satisfy five independent conditions. Sir J. Cockle made a few remarks upon the construction of Magic Squares. Messrs. Cayley, Henrici, Roberts, Harley, Hart, and other gentlemen spoke on the subject. Prof. Henrici gave some properties of Frames. Prof. H. J. S. Smith read papers "On a Modular Equation" and "On the Formula for Four Abelian Functions answering to the Formula for Four Theta Functions. Mr. J. J. Walker communicated a Quarternion Proof of Minding's Theorem.

ASTRONOMICAL SOCIETY.

FEB. 14TH.—Annual Meeting.—Lord Lindsay, President, in the chair.—Mr. J. Marshall and Mr. R. P. Thomas were elected fellows. After a short discussion, it was resolved that the livings of Hartwell and Stone, which were presented to the society by the late Dr. Lee, should by sold to Mr. Lee, should be sold to Mr. E. Lee for a sum of £700. The President then delivered his address. On presenting the gold medal of the society to Prof. A. Hall, after enumeratin the earlier astronomical work of Prof. Hall, and the unsuccessful searches which had been made for satellites previously to 1877, he proceeded to describe the first observations of the satellites. The previous failures of distinguished observers did not discourage Prof. Hall from attempting the search. On the 11th of August, at 14h 30m, Prof. Hall discovered the outer satellite, but he had hardly time to complete the observation of its position when a fog springing up hindered any further observations till the next day. Up to the 16th bad weather prevented further observation, but on that evening the satellite was again found on the north following side, but near to elongation. On the 17th, while watching for the outer satellite, Prof. Hall discovered the inner satellite. The observations having been confirmed the discovery was announced to the public. The President's address also contained a critical examination of the method adopted by Prof. Hall for the calculation of the elements of the orbits. The medal having been given, portions of the annual report were read, and the society proceeded to the election of council and officers for the ensuing year. The following gentlemen were delared to be elected: President, Lord Lindsay: Vice-Presidents, Prof. J. C. Adams, Sir G. B. Airy, Dr. W. Huggins, and D. W. Lassell; Treasurer, F. Barrow; Secretaries, J. W. L. Glaisher and A. C. Ranyard; Foreign Secretary, J. R. Hind; Council, Sir E. Beckett, Prof. A. Cayley, A. A. Common, E. Dunkin, D. Gill, E. B. Knobel, G. Knott, A. Marth, E. Neison, Captain W. Noble, H. Sadler, and Captain G. L. Topman.

ZOOLOGICAL SOCIETY.

FEB. 4TH.—Dr. Günther, V.P., in the chair.—The secretary read a report on the additions to the Menagerie during January, and called special attention to the Bar-winged Bail (*Rallina pæciloptera*, Hartlaub) from the Fiji Islands, and to a young male Giraffe (*Camelopardalis giraffe*). Mr. Sclater exhibited and made remarks on a specimen of a Curassow, belonging to the Royal Museum of Copenhagen, which Prof. Reinhardt had proposed to refer to a new species (*Mitua Salvini*). Mr. R. B. Sharpe exhibited a series of Bulwer's Pheasant (*Lobiophasis Bulweri*) from the Lawas River, North-west Borneo, collected by Mr. W. H. Treacher, Acting Governor of Labuan. Communications and letters were read from Prof. A. H. Garrod on certain points in the anatomy of the Hoatzin (*Opisthocomus cristatus;*) by Mr. Sclater on the breeding of the Argus Pheasant and other Phasiandæ in the society's gardens; from the Rev. O. P. Cambridge, on a new genus and species of spiders, proposed to be called *Fritzia Muelleri;* by Mr. W. Ottley, the first part of a series of observations on the structure of the eye-muscles in the mammalia; from Mr. O. Salvin, on some birds transmitted by the Rev. T. Powell from the Samoan Islands, amongst which were two new species, proposed to be called *Pinarolestes Powelli* and *Fregetta mæstissima;* from Mr. W. H. Dall, on the use of the generic name Gouldia in zoology; by Mr. G. A. Shaw, on four species of Lemurs, specimens of which had been brought alive to England in 1878 from the province of Betsileo, in Central Madagascar; from Mr. F. Moore on some new Asiatic Diurnal Lepidoptera; and by Dr. A. Günther, on the characters of a new Rodent from Medellin, U.S. of Columbia, for which the name *Thrinacodus albicauda* was proposed.

CHEMICAL SOCIETY.

FEB. 6TH.—Dr. Gladstone, President, in the chair.—This meeting was occupied by the discussion "On the Processes for determining the Organic Purity of Potable Waters," a paper read by Prof. Tidy some time since. Dr. Frankland opened the discussion and criticised at some length the objections urged by Prof. Tidy against his method of estimating the carbon and nitrogen in a water residue by combustion. The discussion was continued by Mr. Wauklyn, Mr.

Kingzett, Prof. Bischof, Dr. Voelcker, Mr. Grosjean, Dr. Dupré, Mr. W. Thorp, and Dr. Hake. Prof. Tidy briefly replied.

INJURIOUS NATURE OF TAXATION OF INVENTION.

THE United States Congress has now before it a bill for altering the Patent Law, section eleven of which proposes to require the payment of periodical taxes, as in England, France, and other countries. As to the injurious effects of such taxation, the *Scientific American* observes:—

"The object of section eleven is to make void certain patents described as undeveloped and useless, yet involving principles or devices which subsequent experimenters may want to use. To accomplish this end a special tax is laid upon all patents, in a fee of fifty dollars at the end of four years, and another fee of one hundred dollars at the end of nine years; non-payment of either killing the patent.

"It is argued that if an invention has any real merit its profitable development will speedily follow, as a matter of course; in which case the additional fees will be no burden. If, however, the invention is not at once profitable, or if the inventor does not believe in it sufficiently to be willing to pay one hundred and fifty dollars for the confirmation of his right, it may be fairly presumed that the invention does not constitute a progress in the arts, and accordingly does not deserve the protection of the law. All such undeveloped inventions, it is claimed, are virtually abandoned by their owners; and although the patentee has done nothing contrary to his agreement with the nation, nothing to warrant the forfeiture of his right, the nation may justifiably break its part of the contract and allow the inventor's right ('exclusive right,' in the terms of the Constitution) to be freely invaded.

"The fallacies which underlie this specious argument have been repeatedly exposed in these columns and elsewhere. We do not propose to discuss them here. Our purpose is rather to note briefly some of the inventions for which America is justly proud; inventions which have added enormously to the nation's wealth and power; and to ask how it would have fared with them if section eleven formed a part of the patent law of the past.

"To no one man is this country more indebted for its industrial and commercial rank than to Eli Whitney. The world knows what a long and, for many years, profitless fight he had to wage with prejudice and injustice before his invention was so far established as to be beyond condemnation as 'undeveloped and useless.' What would have been the effect of adding to his already overwhelming burdens the additional fees prescribed by section eleven?

"In 1833 Obed Hussey patented an invention which solved the problem of a harvesting machine. For many years he laboured almost in vain to advance his invention to the stage of practical and profit able usefulness. Would the country have been equally benefitted had his right and his efforts fallen under the encouraging (!) influence of section eleven?

"The early struggles of Elias Howe, Jr., the inventor of the sewing machine—struggles against poverty and injustice as well as the stolid prejudice of the community—are known to all. His first machine was finished in the spring of 1845. Four years after he was alone and poor in a foreign land. He was indebted to the kindness of a Scotch mechanic for a steerage passage home. He found his wife and children destitute, all their personal effects being still detained to secure the payment of their passage home. His wife was sick; ten days after his arrival she died. He was penniless; and just at that moment, had section eleven been in force, he would have had to pay fifty dollars or forfeit his right to his invention.

"The real value of the Goodyear rubber patent will not be questioned at this late day. Taking up the struggle under which Heywood had succumbed, Goodyear toiled through years of terrible privation to perfect his invention. Success left him in the deepest poverty; and at no time during the entire period of the original patent was his invention a source of profit to him. Under provisions embodied in the proposed amendments to the law the spoilers of Goodyear could easily, and at any time, have dispossessed him of the last remnant of right.

"The Sarven carriage wheel is known the world over. Section eleven would have killed the patent on it most certainly and effectively. During the first eight or ten years of the life of the patent the inventor's efforts to induce carriage makers to adopt his improvement were almost fruitless. His efforts were persistent, his diligence remarkable; yet his invention was commercially "undeveloped and profitless," almost to the end of the term of the patent.

The struggles of Woodworth alone, and afterwards with his partner Strong, to persuade men to adopt his method of finishing boards by machinery, up to the time of his death in poverty in the eleventh year of his patent, would make a volume. His invention was radical, valuable, era-making in the art of carpentry; yet section eleven would have killed his patent without compunction.

"Another radical and immensely valuable invention was Henry Voelter's process of making paper-pulp from wood. The best years of the inventor's life were given to the development and introduction of the improvement, and in combating the prejudice of the trade to the use of wood pulp in paper. He was able and willing to spend the greater part of the life of his patent, and seventy thousand dollars, in demonstrating the usefulness of his idea. He may have been able to pay the additional fees prescribed in section eleven; another inventor of the same or an equally valuable process might not. In either case would the payment or non-payment of the fees have been any evidence of the intrinsic worth or worthlessness of the invention?

Daniel Lamson invented a machine for making hoops. It was not a great invention, yet it was novel and unquestionably valuable. He was a poor man; and before he had succeeded in introducing his invention he enlisted in a Massachusetts regiment and was killed at Fredericksburg. Just at that time, the first fee under section eleven would have been demanded of his widow by the Patent Office — a penalty for invention!

It is needless to multiply cases. From the history of inventors and inventions in this country hundreds of similar instances might be drawn. In a very able paper lately read before the Cincinnati Board of Trade, Mr. George H. Knight has furnished a long list of them—instances of patient, persistent, and long-protracted struggles against poverty and class prejudice, to being valuable inventions up to the point of profitable and established usefulness; instances of inventors now ranked among the world's best benefactors, who would have been cheated of their rights, and the progress of the useful arts thereby delayed indefinitely, had there been any section eleven to thwart their efforts. From the very nature of things the most pregnant and novel inventions are the hardest to make commercially successful; and it is these rather than the trivial catchpenny inventions or the inherently worthless inventions, that would suffer most from the killing influence of the proposed amendment; and it is these that the country can least afford to discourage or to destroy.

LIFE-SAVING APPLIANCES AT SEA.

IT would be, alas! too easy to run up a ghastly catalogue of the disasters that have occurred upon our coasts, in our rivers, and upon the ocean, from the wreck of the Royal Charter on the coast of North Wales downwards to the loss of the Princess Alice. What imagination can conceive the sufferings involved by the deaths of the terrible hecatomb of human victims that have been sacrificed by these disasters? Some of the greatest of them rush unbidden into mind; of the Royal Navy, the Captain, the Eurydice; of other services the Deutschland, in which fifty-seven men and boys were drowned; the La Plata, with sixty-four victims; the Northfleet, with four hundred and ninety-three; the Schiller, with three hundred and thirty-one; the Atlantic, with seven hundred; the Princess Alice, with as many; and a host of others that we have not heart to chronicle.

But why refer to these disasters at all? simply for the practical purpose of saying that some mining and marine accidents are not preventable by any possible human skill or forethought, but that all that *may* be done, and that *ought* to be done to save human life, particularly in the class of accidents last referred to, is *not* done.

For years past attention, more or less intelligent and persistent, has been given, by exhibitions and otherwise, to means for saving the lives of the crews and passengers of ships that are burned, that founder, or from whatever cause are wrecked at sea or on navigable rivers. True there are exhibitions and discussions, but what has come of them? As yet nothing! For many years past it has been perfectly well known and admitted that no sea-going ship carrying a large number of passengers, emigrants, or troops can carry also a sufficient number of boats to take off their living freight in case of sudden emergency. Many such ships have not boat accommodation for more than a small fraction of their passengers and crew. But, besides, it is notorious that the boat system, when wanted in case of life or death, almost invariably breaks down. The boats are often stowed amidships, perhaps one inside the other, cumbering the deck, and impeding the working of the ship, and so lashed that it may be the work of an *hour*, in supreme *moments* of danger, to get them disengaged. With respect to other boats attached to the ship, they should be, as in the case of the La Plata, and in every other ship, a source of safety, but, as in that case, they sometimes actually prove a source of danger. One of the La Plata boats was carried away with its davits that tore a hole in the ship's side. It is an oft-told story that in shipwreck the boats have utterly failed as a desperate last resort. One has to be let down into the sea by the bow, and another stern on, and hence neither can be made available to save the drowning people; with others of the boats, the falls are foul, the covers are on, and the plugs are not in; another boat that looks likely to reach the water on a fairly even keel, gets staved in in the act of lowering.

A remedy, or a palliative at least, for this state of things has been provided, more or less completely, by several inventions that have had the attention of naval officers, engineers, and others qualified to form a sound opinion on the subject. One of the most notable of these is, we venture to think, the self-launching raft of Mr. Richard Roper, of New Cross, that has been submitted recently to several important official bodies, by whom his invention has been highly approved and much admired. The invention was originally intended to apply to ocean-going ships, carrying a large number of persons. In such application the captain's bridge and, if necessary, parts of the poop and forecastle, are to be fitted as rafts, which would serve, to the extent of their respective areas, the purpose of captain's bridge and deck, without presenting any deck encumbrance, or any impediment whatever, to the working of the ship. The essential feature of the invention is that the rafts be constructed on the cellular principle—that is, that the floor, or deck, be laid upon a platform of closely connected air-tight chambers of steel, iron, or other metal, or of wood. The bulwarks, on port and starboard sides, are hinged to allow the rafts to be let down, at a slope, upon either side, according to the state of wind and weather. The releasing gear is by a very simple rack and pinion motion, and the raft can be let over the side in a few seconds by any one, even although he may be utterly destitute of mechanical experience or skill. The raft in its normal condition rests upon iron beams, and is furnished with bottom and side friction rollers, to prevent jamming. It is fitted with air-tight lockers stocked with provisions, water, sweeps, sails, masts, compass, signals, stores, &c., for a possible voyage. In a ship of 40 feet beam one of these rafts, of say 20 feet beam, would have buoyant power sufficient to float 350 persons, and could be launched without the need to cut away any lashing or covering. It would not be affected by ice, snow, or temperature.

The inventor seems to be a man who can adapt himself to circumstances, and, this being so, it is not surprising that the disaster to the Princess Alice saloon steamer should have led him to give an admirable illustration of the application of his invention to river steamers. To the Board of Trade Court of Enquiry, the coroner's jury, and other public bodies he exhibited a beautiful model of the Princess Alice fitted with seven of his rafts, that, all being well, would only have served as so much deck space. The model was plunged into a large tank, when the hull sank at once, but the rafts kept afloat with buoyant power sufficient, by calculation, to have carried 950 persons. In this way, although sufficiently secured in their seats, there is no fastening between the rafts and hull or frame-work of the vessel; for river navigation Roper's rafts are self-floating, and require no launching gear whatever. The hapless victims on the Princess Alice, it may be remembered, had neither raft, boat, hen-coop, nor aught else to cling to in their fatal bath.

A scientific contemporary of high repute has said of this invention: "No such promising, because practical, invention for reducing the present disastrous loss of life at sea has yet been brought forward, and on this ground we trust it may receive a warm welcome from the public, a fair trial by the great steam companies, and by ship-owners generally." If authority can sustain this invention, it has the highest, being upheld by the most eminent naval officers, engineers, ship-builders, and captains of the mercantile marine.

NITRIC ACID PRODUCED BY THE ELECTRIC LIGHT.

Mr. T. Wills, F.C.S., has been making some experiments on the production of oxides of nitrogen in the electric arc. The atmosphere of course consists mainly of oxygen and nitrogen, but simply in a state of mechanical mixture; if these gases become chemically combined, they form several oxides of nitrogen, most of which are strong and corrosive acids. At a high temperature small quantities of these gases can be made to unite. This is the case when electric sparks are passed through air; also during the combustion in air of a very hot flame, such as that of hydrogen; it therefore seemed probable that, as the temperature of the electric arc is undoubtedly very high, nitric acid, or some other oxide of nitrogen, might be produced by the electric light. The first experiment was rather surprising. A glass cylinder placed over an electric lamp (Foucault's regulator) for two minutes, and afterward examined, was seen to contain a perceptible amount of red fumes, due to peroxide of nitrogen (N_2O_4). The air surrounding the lamp was next drawn through a solution of potash, and the amount of nitric acid produced per hour (it may eventually prove to be more, the difficulty being to collect the whole of it.) The next step in the research will be to examine the various forms of electric light, with a view to determine the amount of nitric acid produced by each. One of the advantages heretofore claimed for the electric light over gas light has been that the products of combustion of the former were harmless, while gas light produces the deadly carbonic acid.

NEW CAUSTICS.

Two caustics, which promise to be most valuable, have recently been introduced to the notice of the medical profession by Dr. B. W. Richardson. They are sodium and potassium alcohols. When applied to the skin these alcohols are said to cause "gradual destruction of tissue, which may be so moderated as hardly to be perceptible, and may be so intensified as to act almost like a cutting instrument."

These caustics have the advantage that they will dissolve opium, like ordinary alcohol, and also that their action can be stopped immediately by dropping on the eschar a little chloroform, which decomposes the caustic into chloride of the metal and triethylic ether, which is inert locally.

A VEGETABLE GREEN FOR CONFECTIONERS.

It appears, according to one of the French papers, that from the grains of raw coffee there may be extracted a beautiful green colouring matter adapted to all the purposes of the cook and confectioner, and which will undoubtedly prove of great value as a commercial product, inasmuch as the number of green colours suitable for such uses, and which are not poisonous, is very limited. According to M. Zech, who describes the process of extraction, the colouring matter is obtained in the following way: The coffee grains are crushed and the oil is extracted by means of ether; they are then dried and agitated with the white of eggs, so as to form a sort of paste, and the latter is exposed for several days to the air. The presence of the white of eggs then determines the appearance of an emerald green. A simpler process is to merely moisten the crushed and desiccated coffee berries with water, expose them three or four days to the air, and extract the colouring matter by means of alcohol.

RECENT AMERICAN AND FOREIGN PATENTS.

Mr. Robert L. Paterson, of Belle Plaine, Kan., has patented an improved attachment for corn planters, which is so constructed that the dropping slide is operated by the advance of the machine to drop the seed at uniform distances apart.

Mr. Horace W. Thompson, of Bellows Falls, Vt., has patented an improved scythe snath fastening, in which the ferrule attached to the end of a snath has a projecting head or plate, in whose outer end is formed an arc-shaped slot to receive and permit lateral adjustment of the loop or eyebolt which clamps the shank of the scythe.

Mr. Henry Hardick, of Liberty, N. Y., has patented an improved fence. The invention consists in a metallic post having an anchoring crossbar or foot cast upon its lower end, and buttons upon one of its vertical sides, for the attachment of the wire rails; an intermediate stay post is also provided which anchors a vertical cross tie connecting the longitudinal wire rails.

An improved cane shaving machine has been patented by Messrs. Charles L. Jones, James W. Smith, and Henry H. Adams, of Gardner, Mass. The object of this invention is to construct a cane splitting machine that will permit of changing the knives adjustable according to the size of the cylinder.

Mr. Hosea T. Stock, of Toledo, O., has patented an improvement in supporting frames for excavating machines, which can be loaded, supported, and moved from place to place on a railroad track, upon an ordinary flat or platform car. Only certain portions need be removed in order to enable the apparatus to be transported like an ordinary railroad car.

Mr. John T. O'Harra, of Dodge City, Kansas, has patented an improved car coupling which is so constructed that the cars will couple themselves when run together, and they may be uncoupled when standing still. The coupling may be operated from the top and sides or from the platform of a car.

An improved hydraulic and wire rope pumping system has been patented by Mr. William P. Barclay, of Virginia City, Nevada. The object of this invention is to provide apparatus for economically raising water from mines and deep shafts, and it consists in the arrangement of a hydraulic engine, with a series of plunger and other pumps, and a system of wire ropes and connections.

An improvement in railway cars has been patented by Mr. Louis Prince, of Nashville, Ohio. It consists in constructing the sides or panels of the car in sections so as to fold together, and in a window casing carrying a sliding sash adapted to swing inward.

Mr. Arthur C. Gould, of Boston, Mass., has devised an improved street sweeper, having an endless belt of brushes, operated by gearing from the axle of the machine, which belt sweeps the dirt upon an apron and carries it to a receptacle. The belt can be raised and sustained out of operation when that is desirable, and in use it adapts itself to the surface of the street.

Mr. William Loudon, of Superior, Neb., has devised an improved double acting lift and force pump, which is so constructed as to throw a continuous stream of water by means of a peculiar arrangement of piston and valves.

An improved apparatus for use in photographic galleries as an accessory in forming backgrounds for pictures has been patented by Mr. William F. Ashe, of New York city. It is so constructed that it may be arranged as a staircase, a balustrade, or a pedestal, as may be required.

Mr. John A. Caldwell, of Brownsville, Tenn., has patented an improved compound bevelling instrument for the use of stair builders, carpenters, millwrights, and others, by which complicated cuts, such as the pitches of handrails and bevels of jack rafters, are easily obtained.

An improved attachment to stemwinder watch cases has been patented by Mr. Joseph Fortenbach, of Carlstadt, N. J. The invention consists in a perforated metallic plate fitted upon the winding stem and interposed between the lock spring and the centre ring, of the watch case, to operate the spring at one side of and out of contact with the stem.

Mr. Gilbert W. Bradley, of Sunderland. Vt. has patented an improved wooden box, The process consists in bending wooden veneers into tubular shape under successively decreasing arcs and increasing pressures, and sewing together the lapped edges.

The device is of simple construction, and requires less power than the complicated machinery at present employed for separating the middlings from the lighter particles.

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ESTABLISHED 1st MAY, 1862.

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